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(54) **ASSISTANT FOR CREATION OF LAYOUTS  
OR REPORTS FOR DATABASES**

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707/104

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See application file for complete search history.

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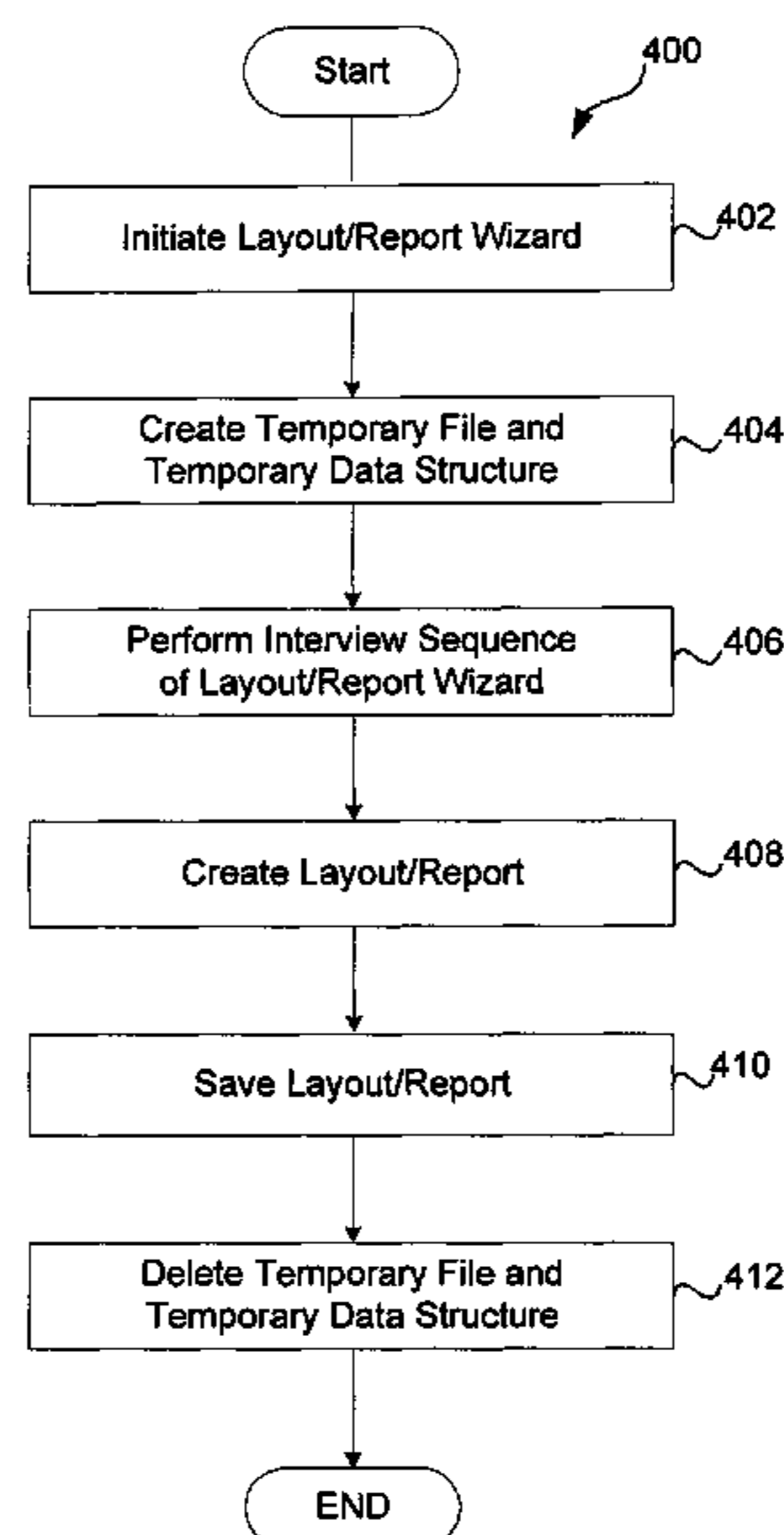
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(57) **ABSTRACT**

An assistant for the creation of layouts/reports for databases is disclosed. A layout for a database is the arrangement of information for the database such as for data entry or screen viewing, and a report (or report format) for a database is the arrangement of information from the database for presentation of the data in a printed document or with on-line viewing. The assistant serves to automate in the creation of the layout/reports after an interview sequence with a user.

**38 Claims, 18 Drawing Sheets**



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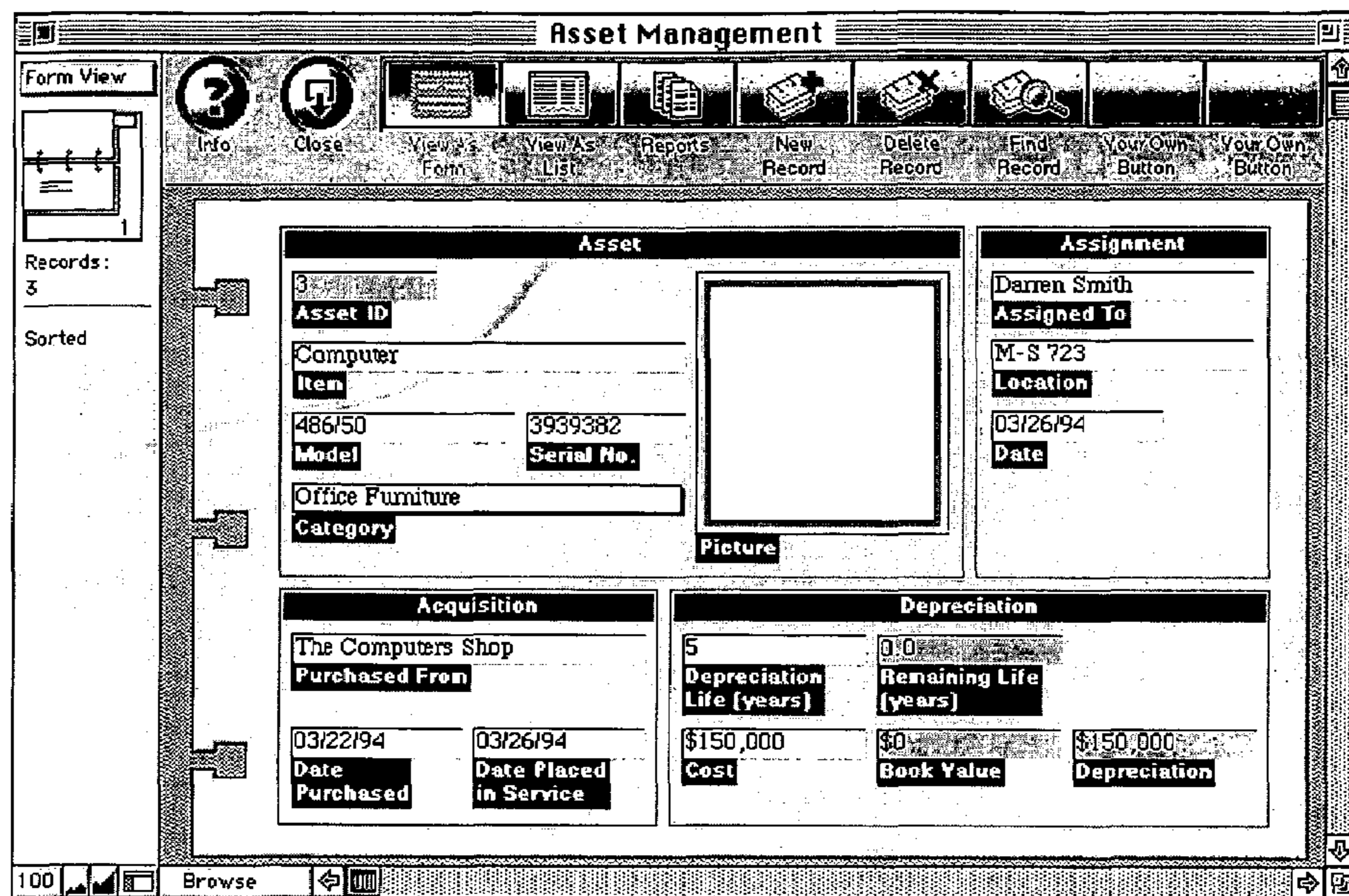


Fig. 1

The screenshot shows a software window titled "Asset Management". On the left, there is a sidebar with a "Depreciatio..." section containing a small diagram and "Pages: 1". Below that are "Script:" and two buttons: "Continue" and "Cancel". The main area displays a table with the following data:

Item	Model	Serial Number	Dep. Life	Rem. Life	Cost	Book Value	Deprec.
<b>Office Furniture</b>					<b>\$150,550</b>	<b>\$0</b>	<b>\$150,550</b>
Computer	486/50	3939382	5	0.0	\$150,000	\$0	\$150,000
Office Chair	Posture Special	3343	4	0.0	\$275	\$0	\$275
Office Chair	Posture Special	3344	4	0.0	\$275	\$0	\$275
<b>Grand Totals:</b>					<b>\$150,550</b>	<b>\$0</b>	<b>\$150,550</b>

At the bottom of the window, there is a status bar with "100", a "Preview" button, and navigation icons.

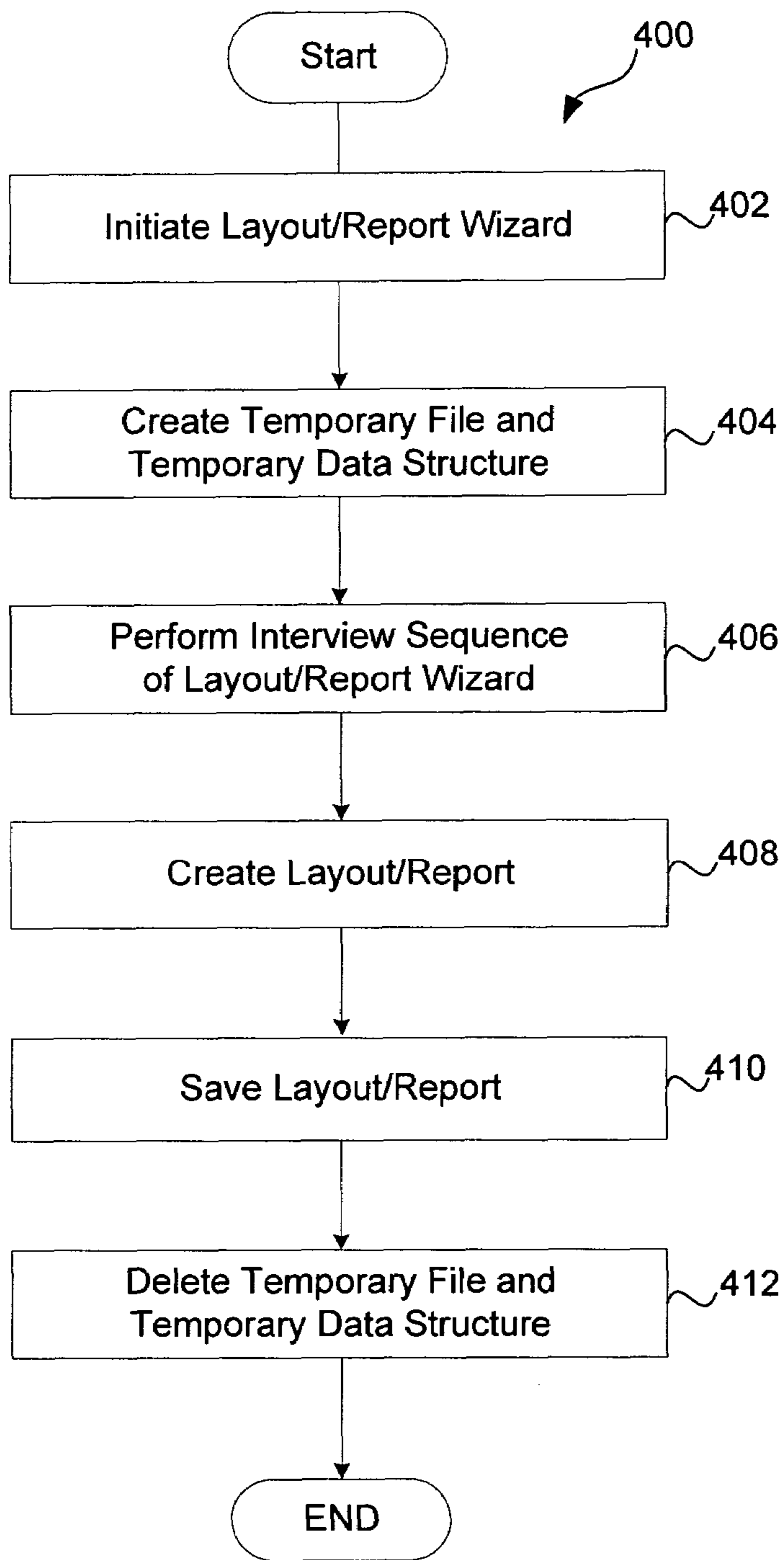
Fig. 2

The screenshot shows the same "Asset Management" software window, but in a different view. The sidebar now shows "Layouts: 7" and a "Field:" dropdown menu. The main area features a toolbar with icons for "Info", "Close", "View As Form", "View As List", "Reports", and "Your Own Button". Below the toolbar is a table with a more complex structure:

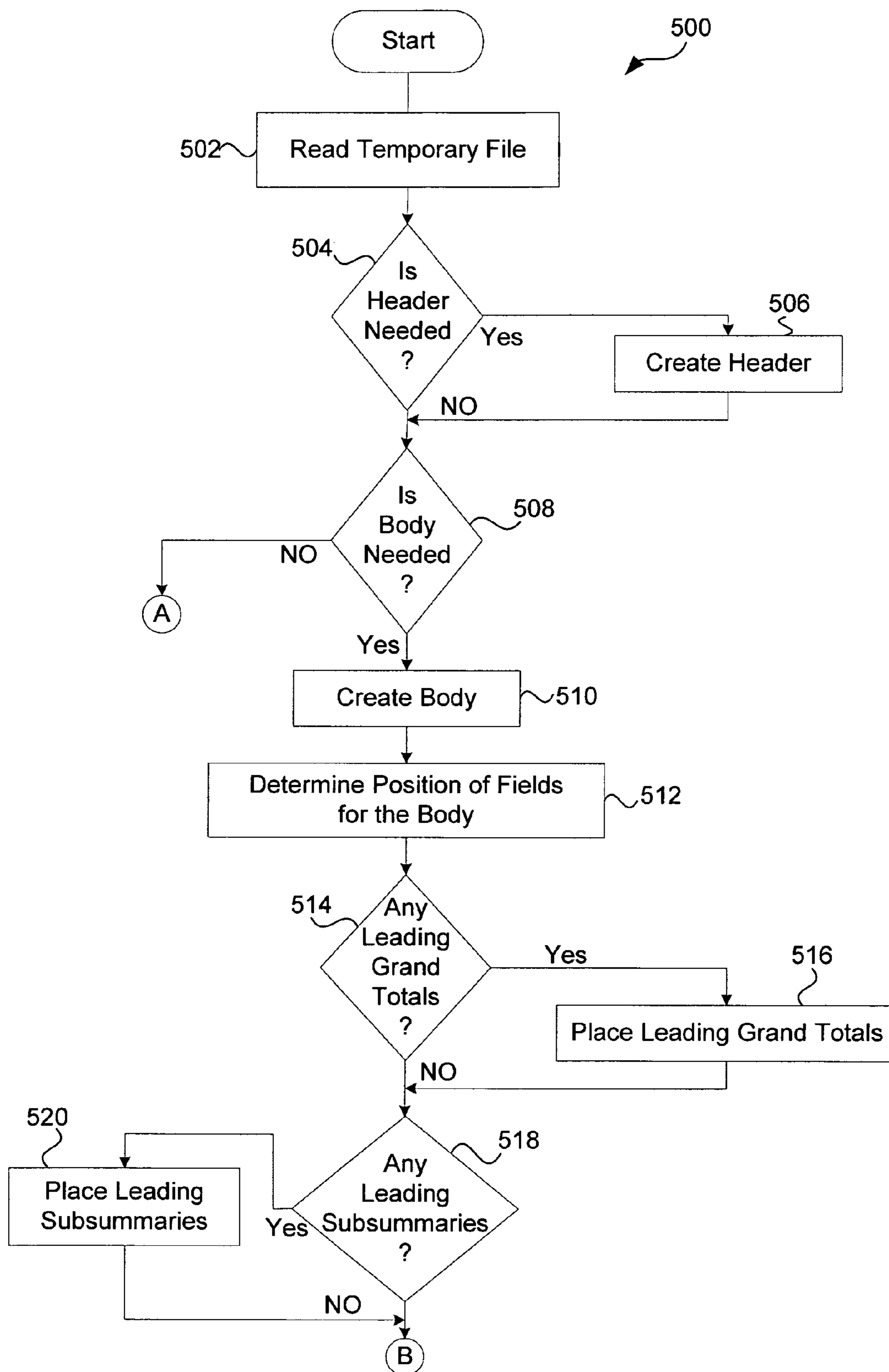
Item	Model	Serial Number	Dep. Life	Rem. Life	Cost	Book Value	Deprec.
<b>Category</b>					<b>Total Cost</b>	<b>Book Val</b>	<b>Total Dep</b>
Item	Model	Serial Num	Dep Life	ing Life	Cost	Book Value	Depreciation
<b>Grand Totals:</b>					<b>Total Cost</b>	<b>Book Val</b>	<b>Total Dep</b>
<b>Page 11</b>							
<b>Asset Depreciation Report</b>							

The status bar at the bottom shows "100" and a "Layout" button.

Fig. 3



**Fig. 4**



**Fig. 5A**

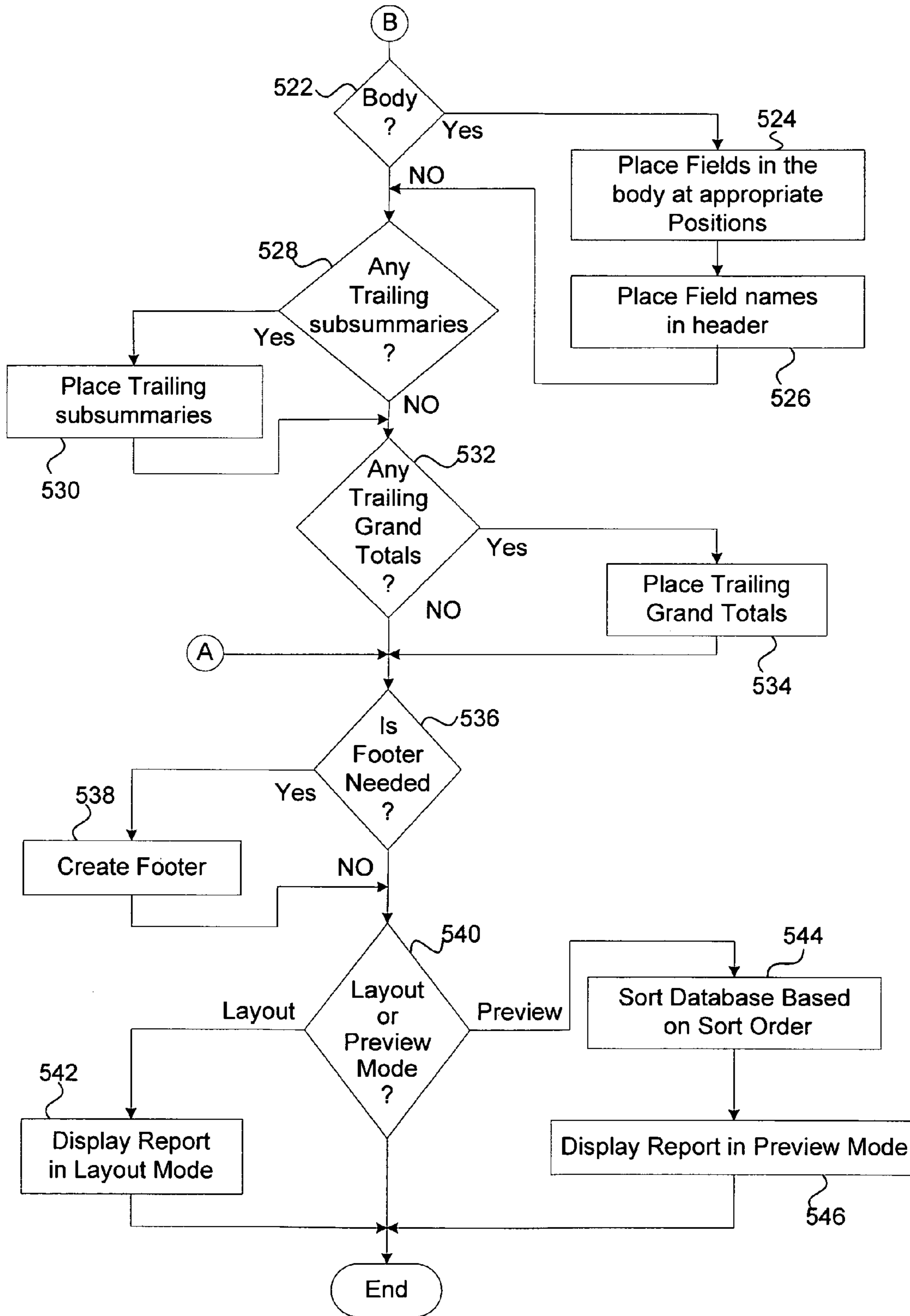
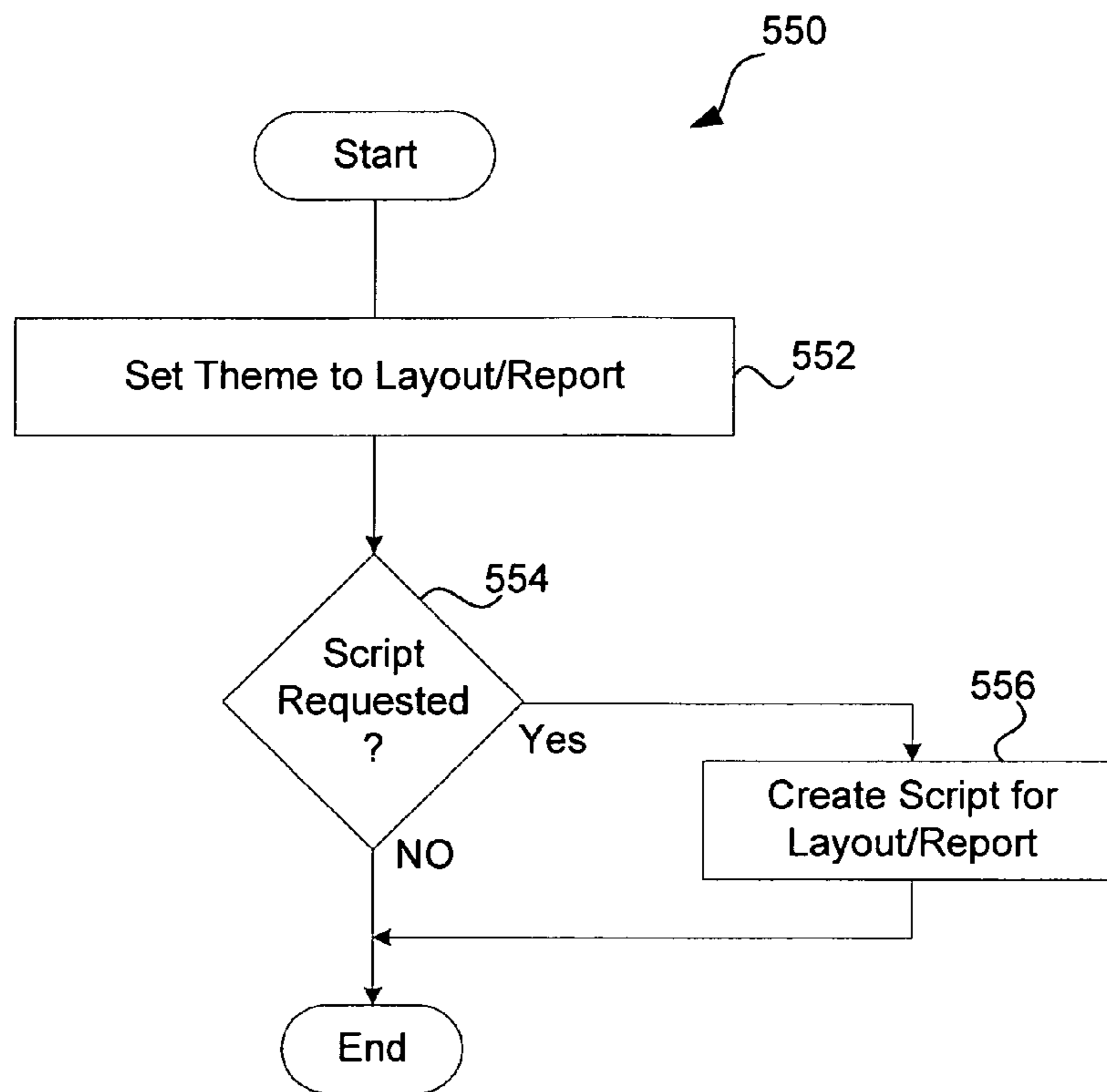
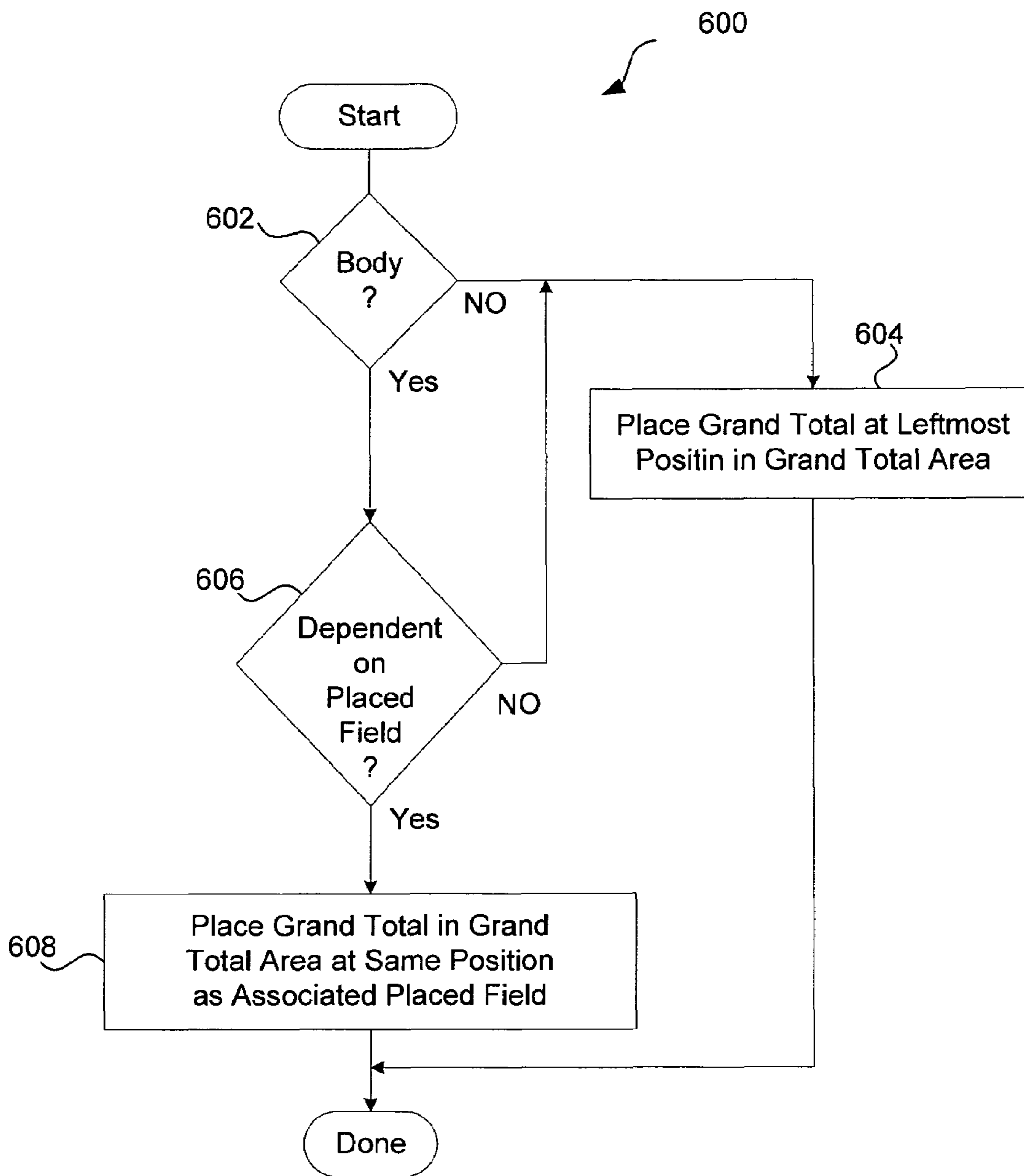


Fig. 5B



**Fig. 5C**





**Fig. 6**

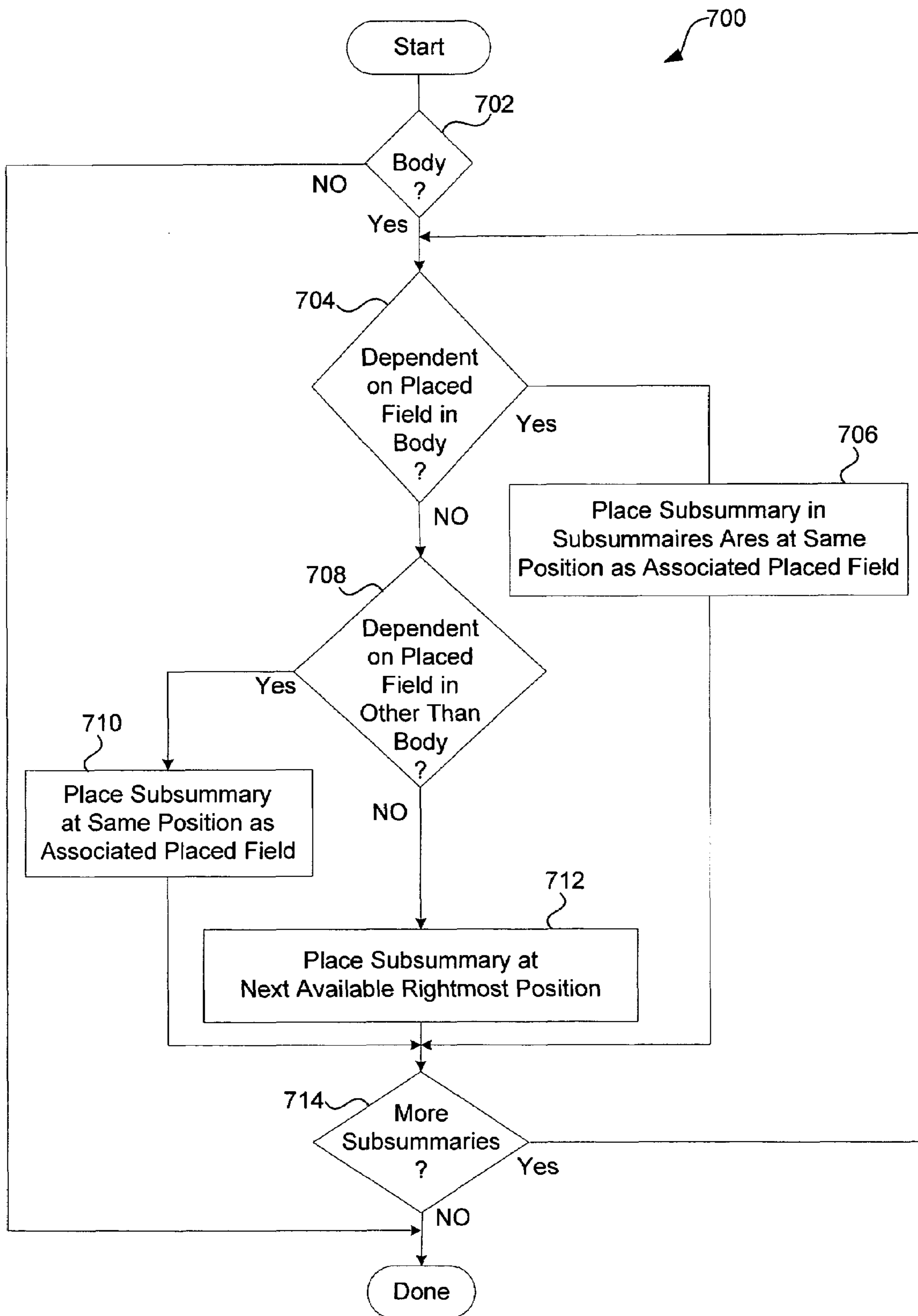
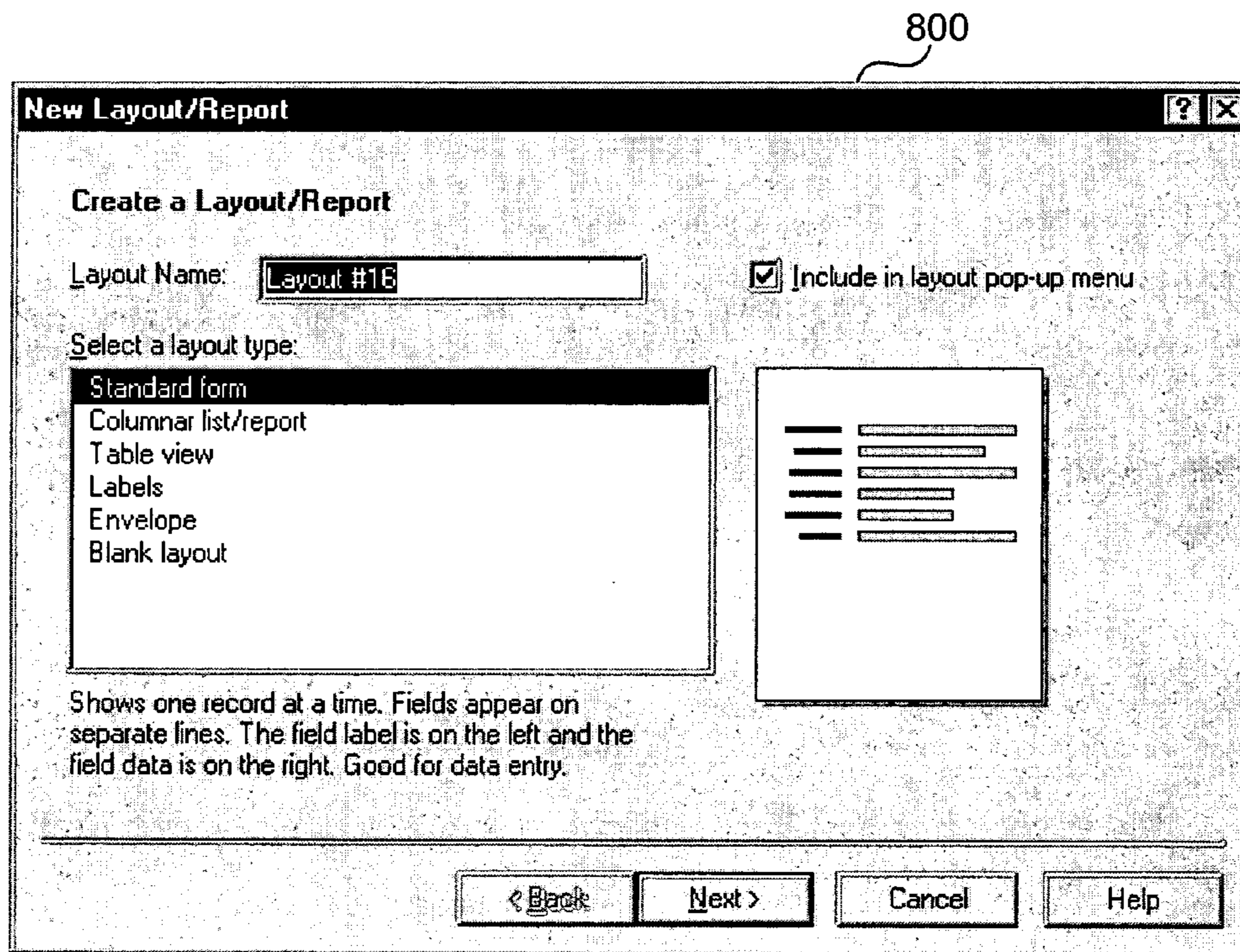
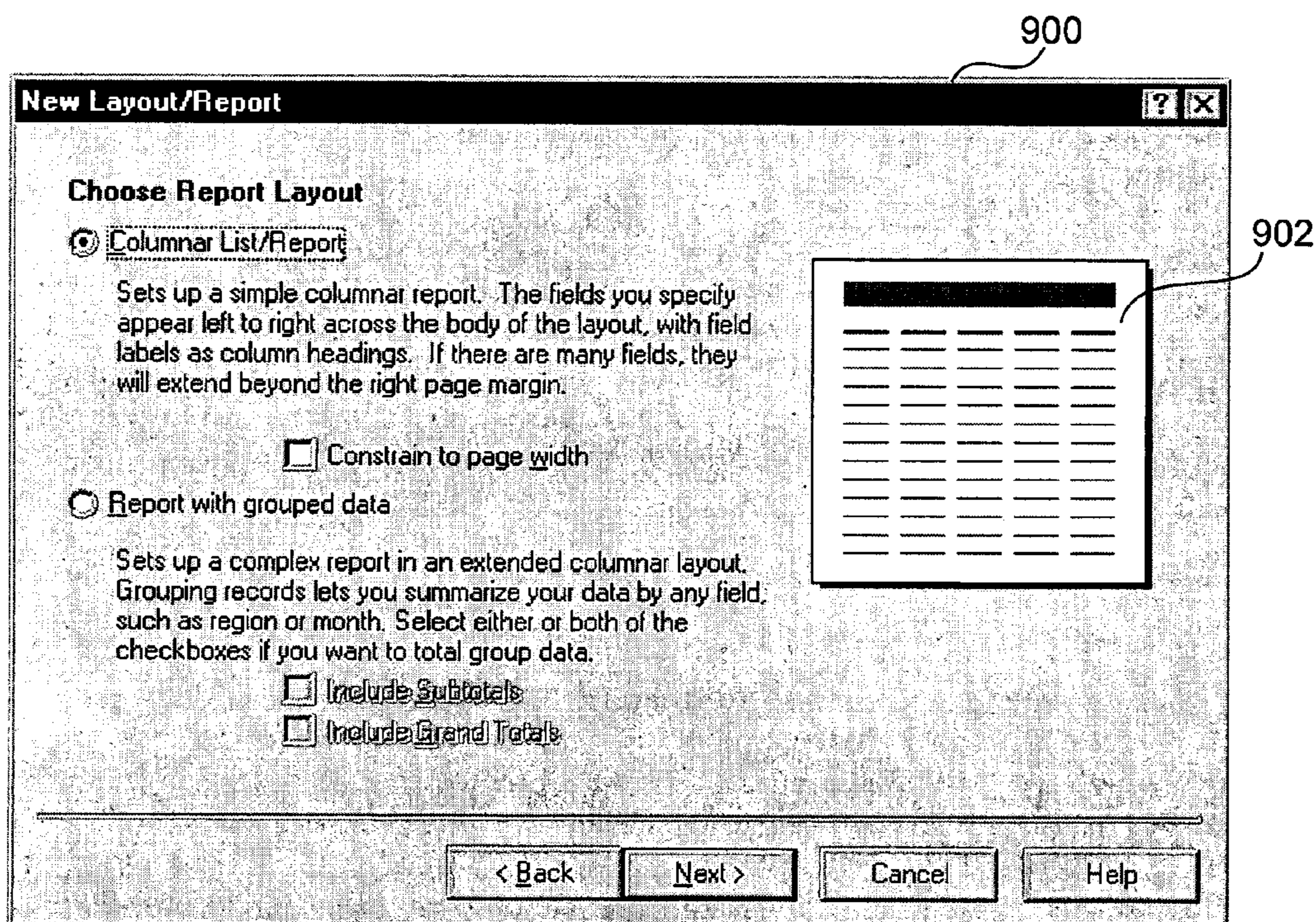


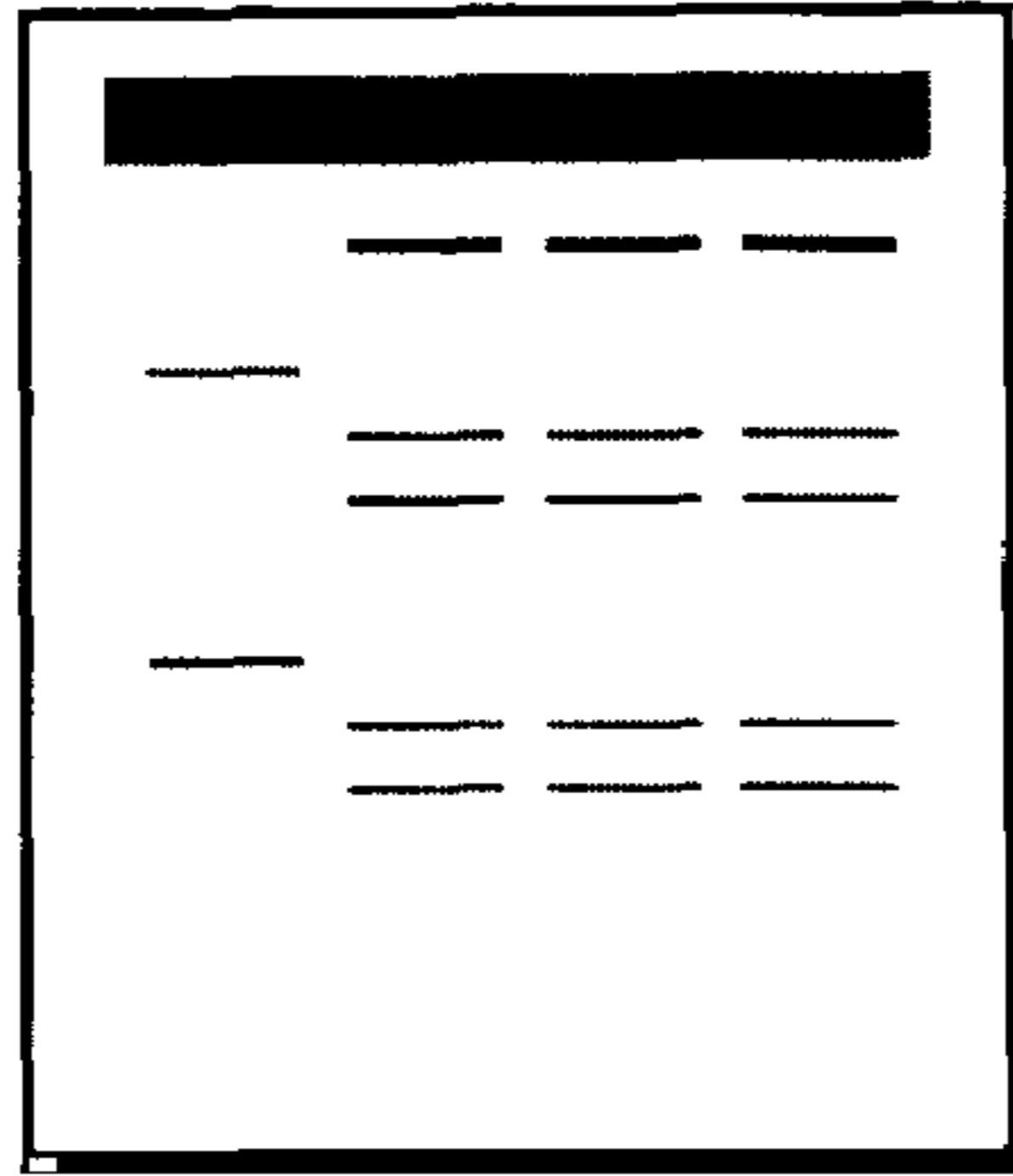
Fig. 7



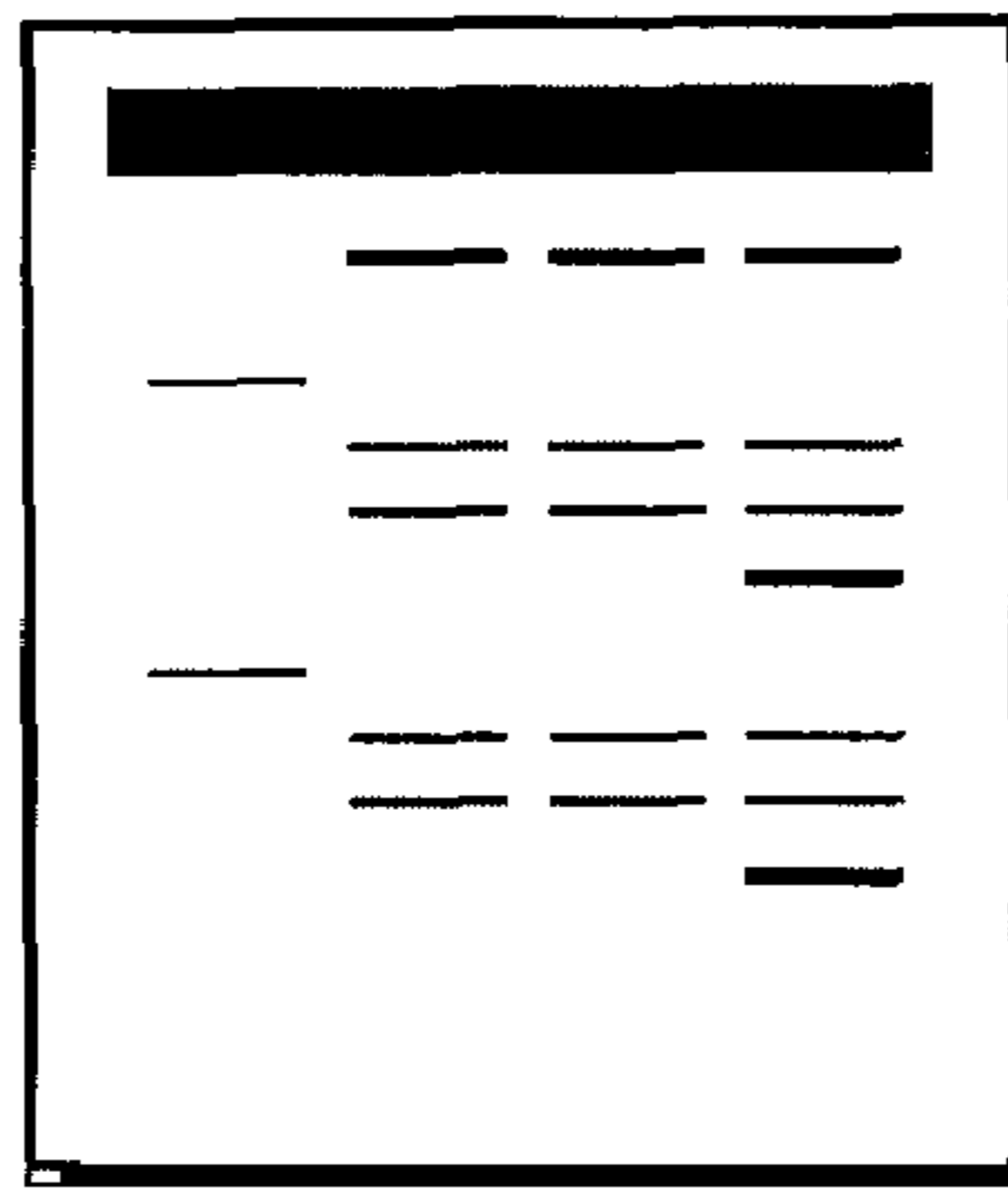
**Fig. 8**



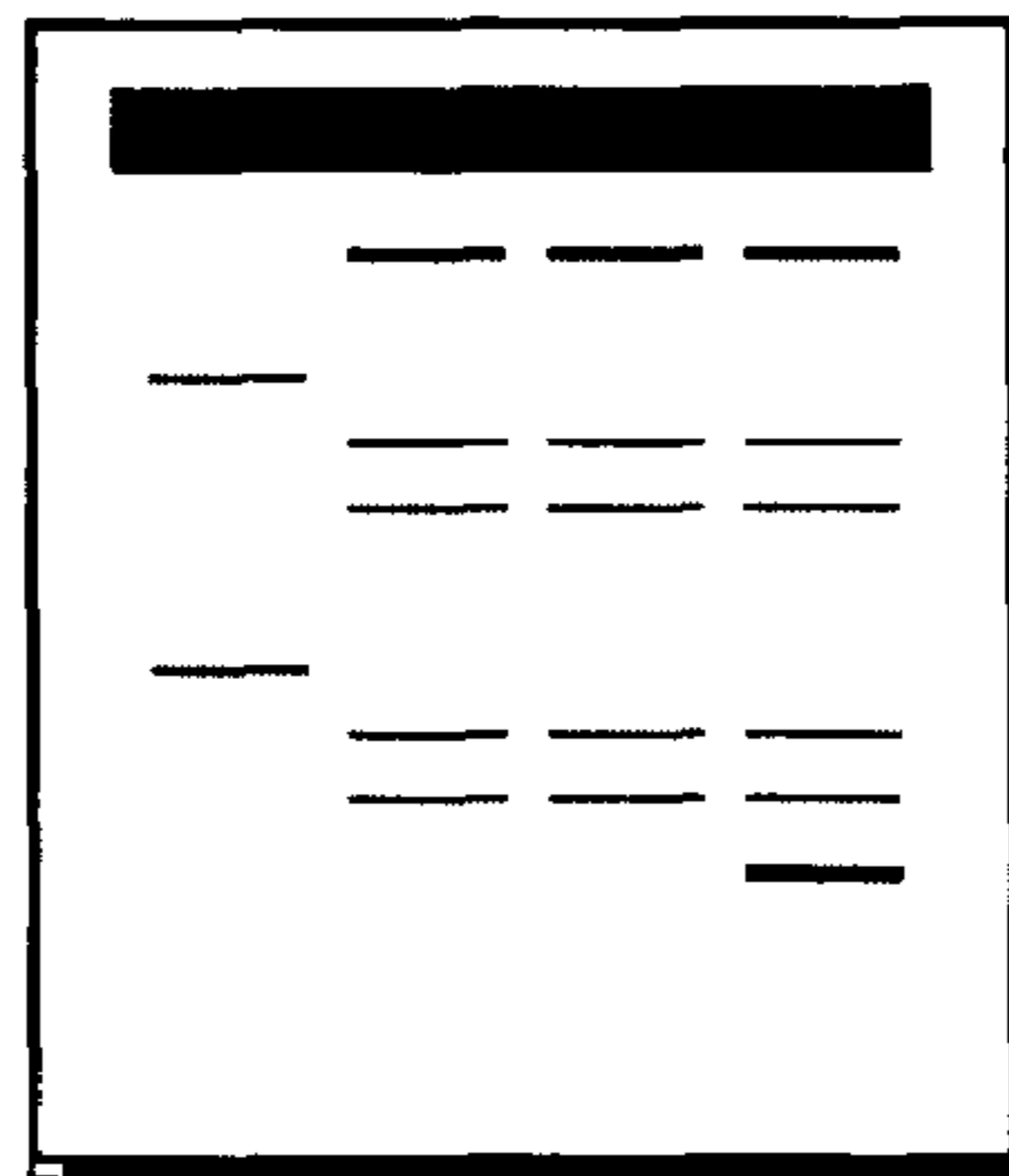
**Fig. 9**



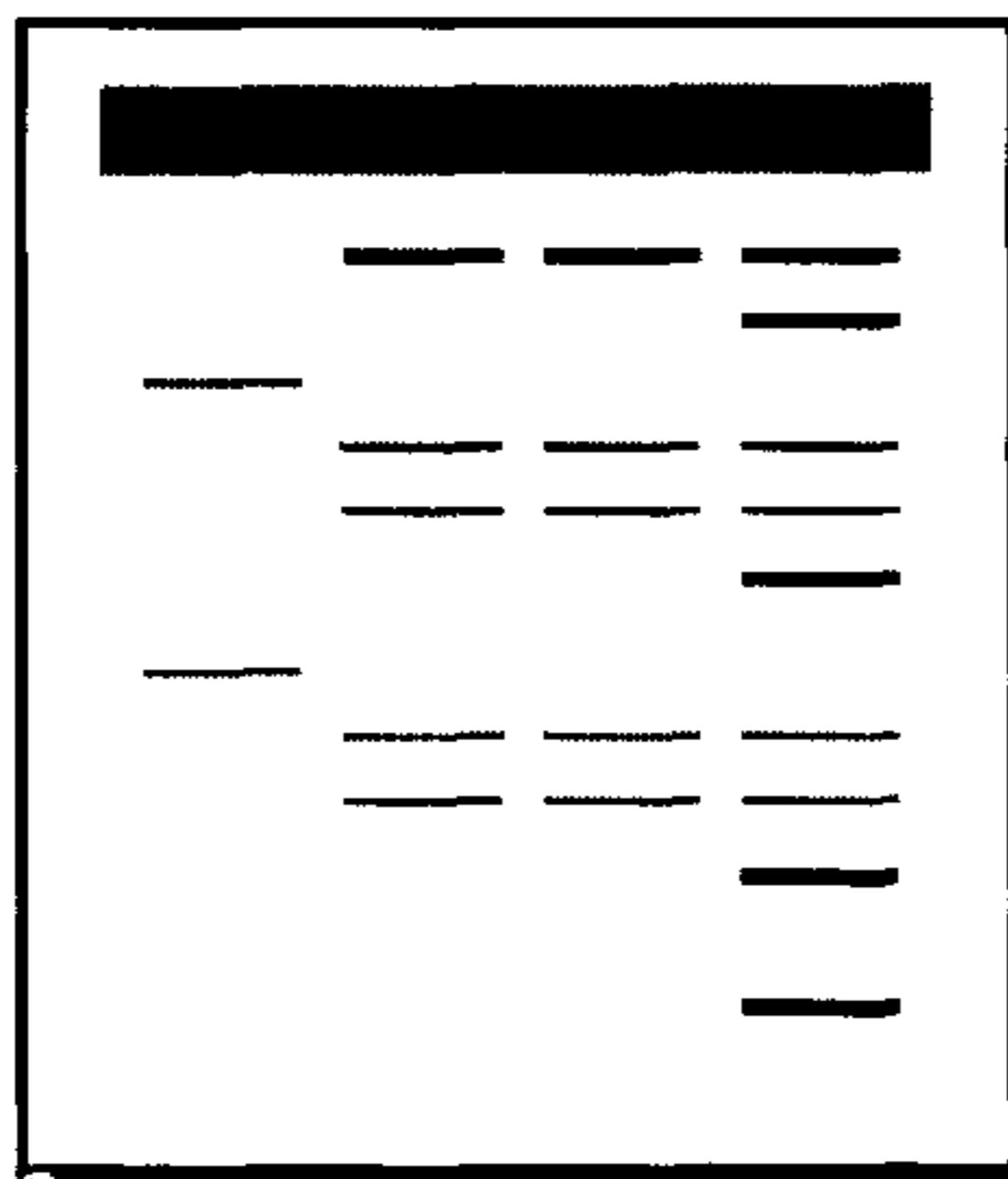
**Fig. 10A**



**Fig. 10B**



**Fig. 10C**



**Fig. 10D**

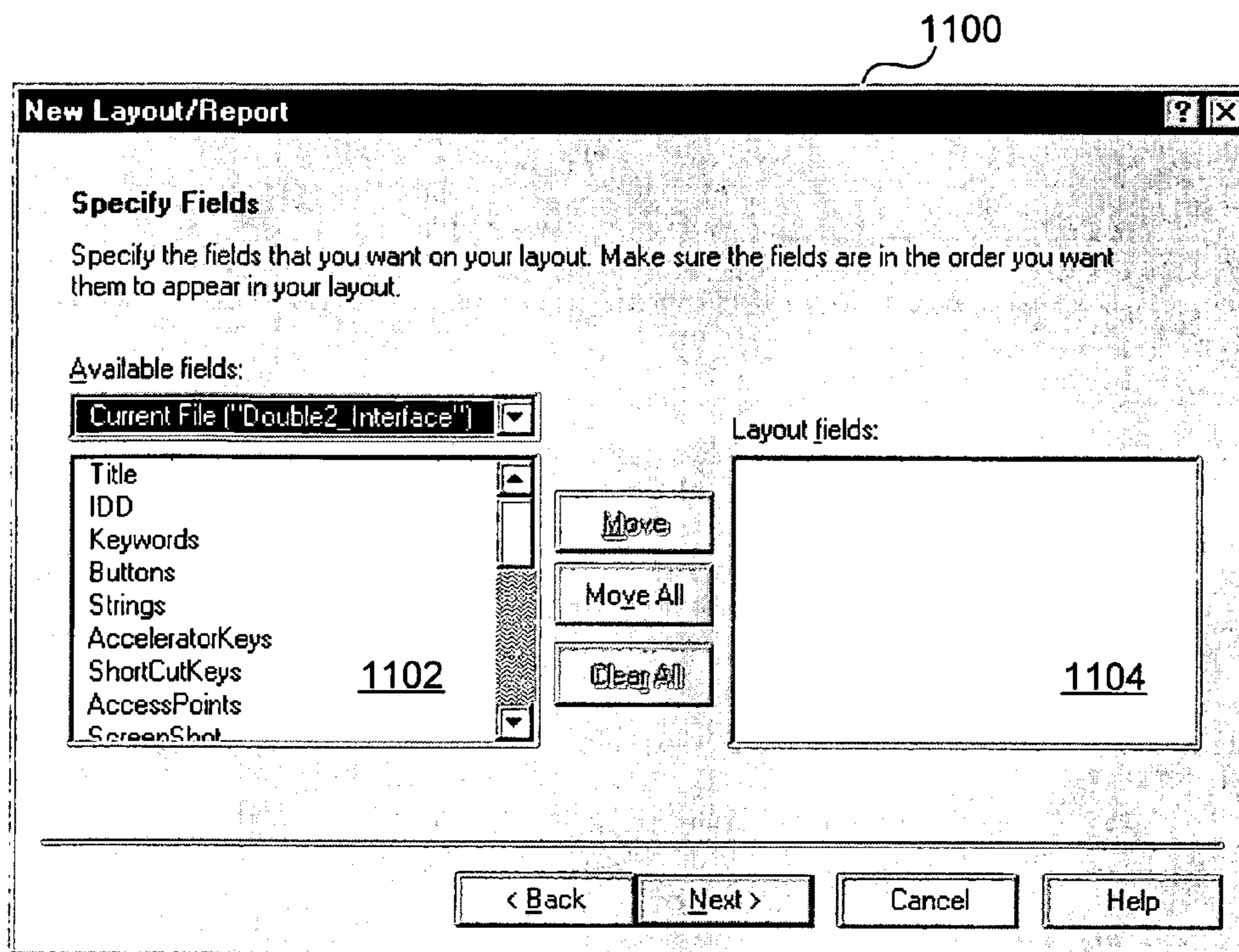


Fig. 11

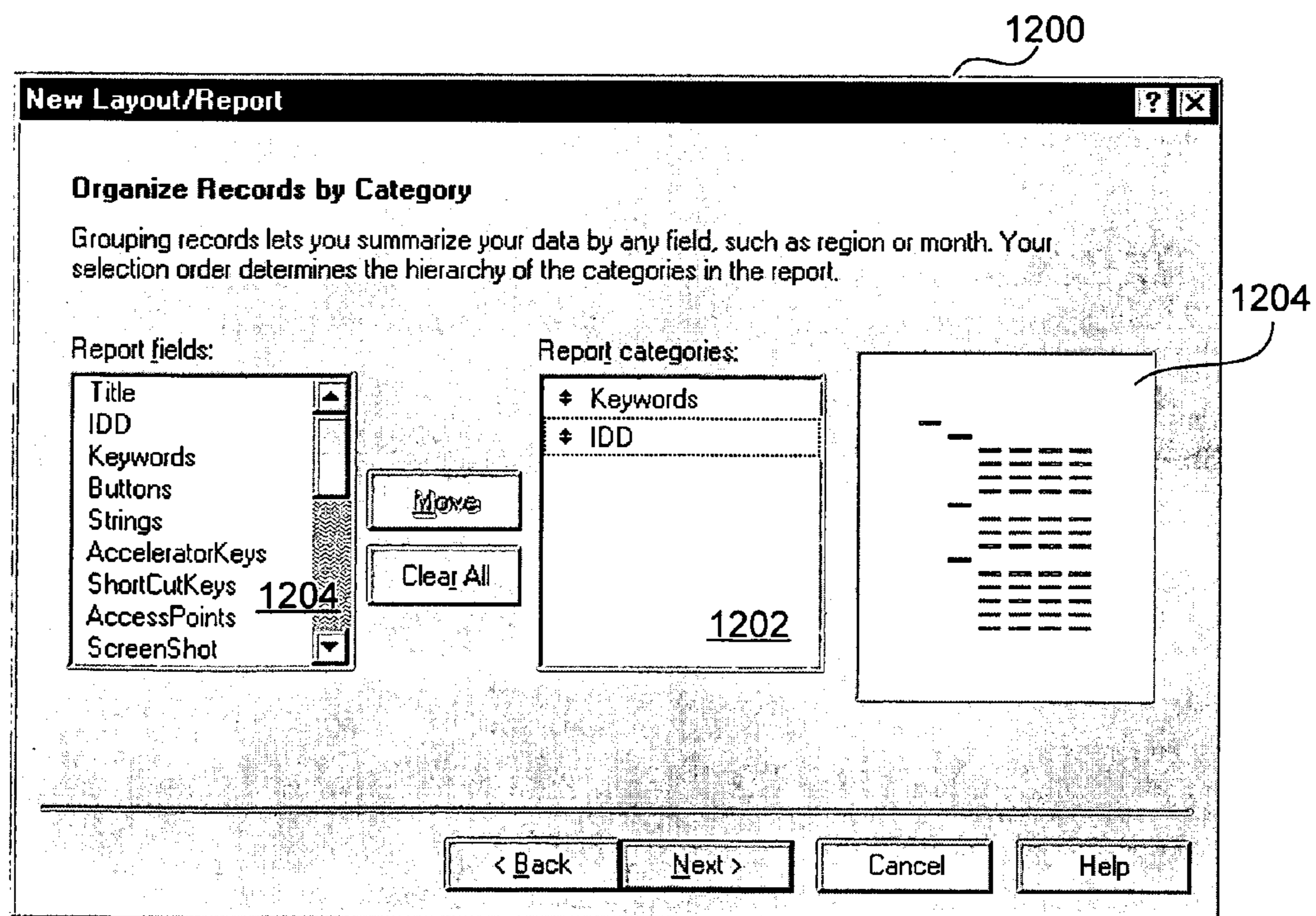
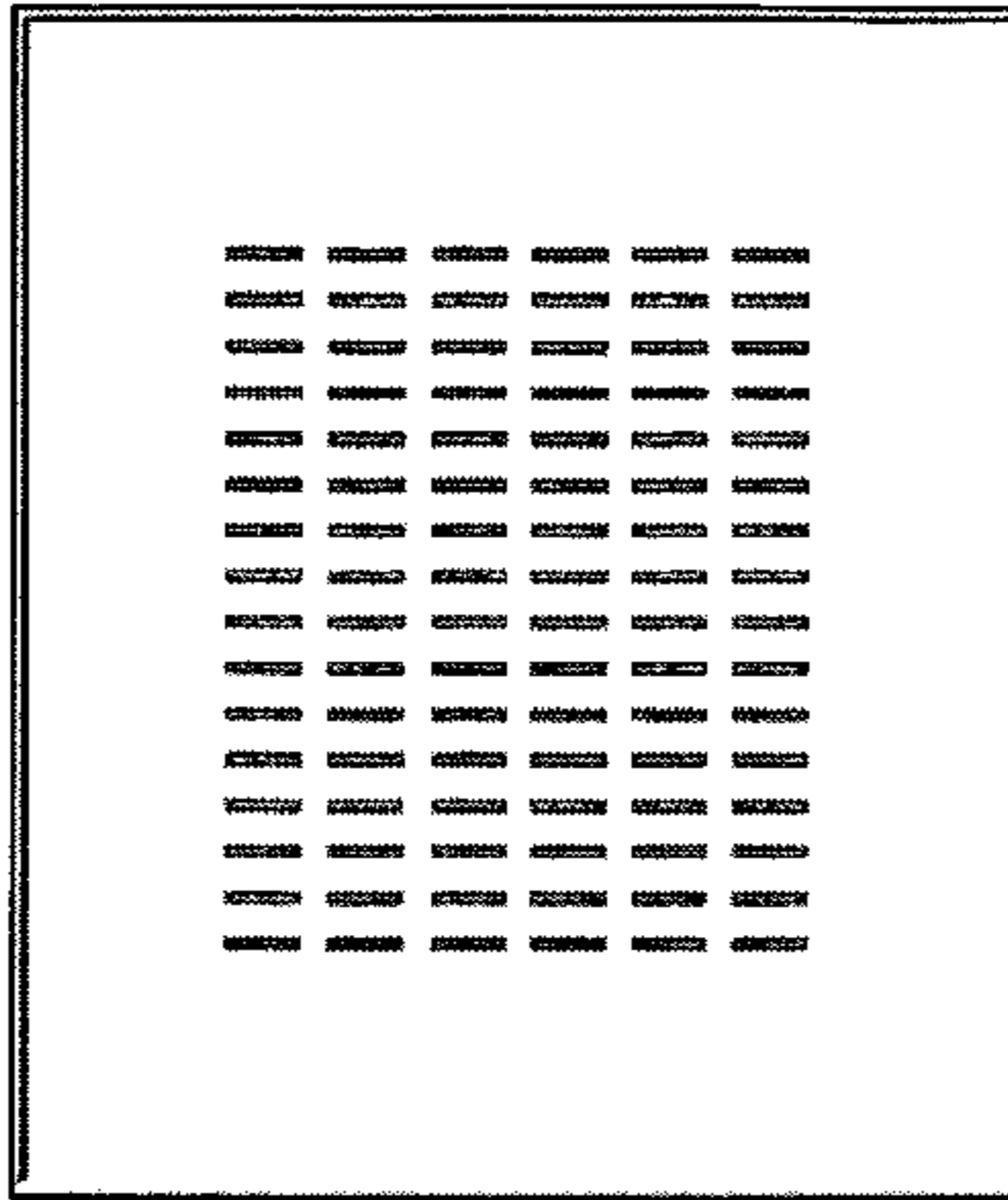
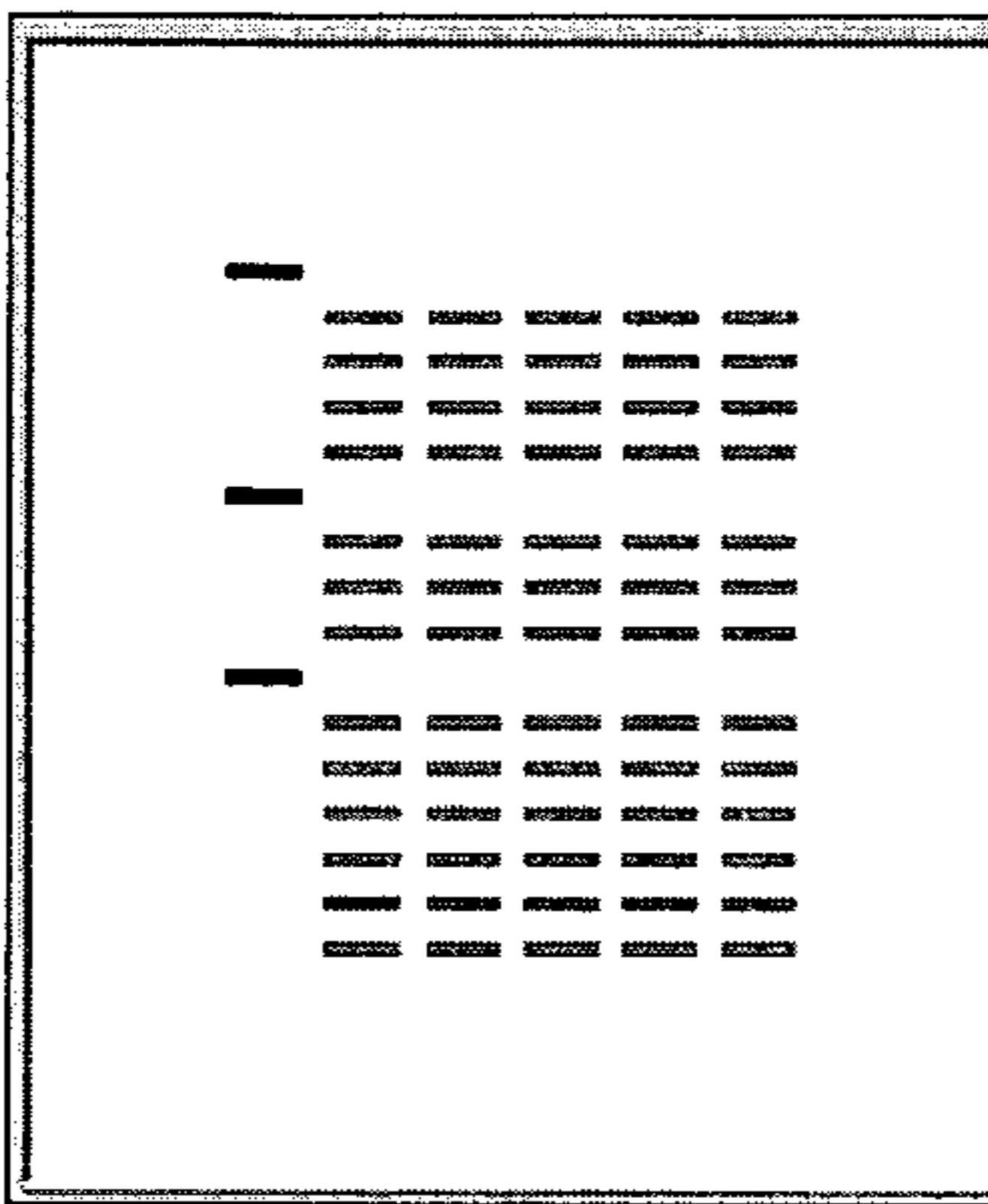


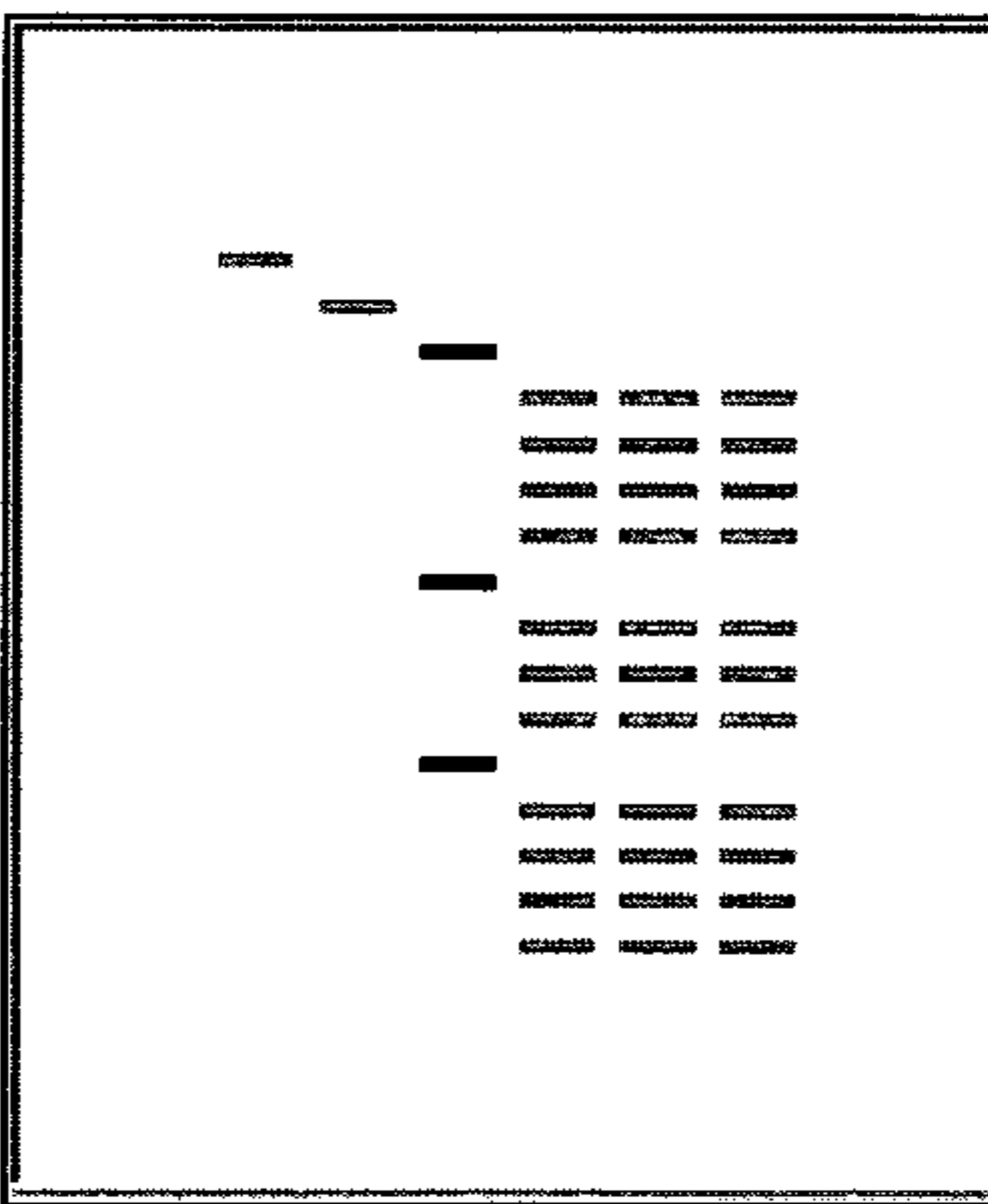
Fig. 12



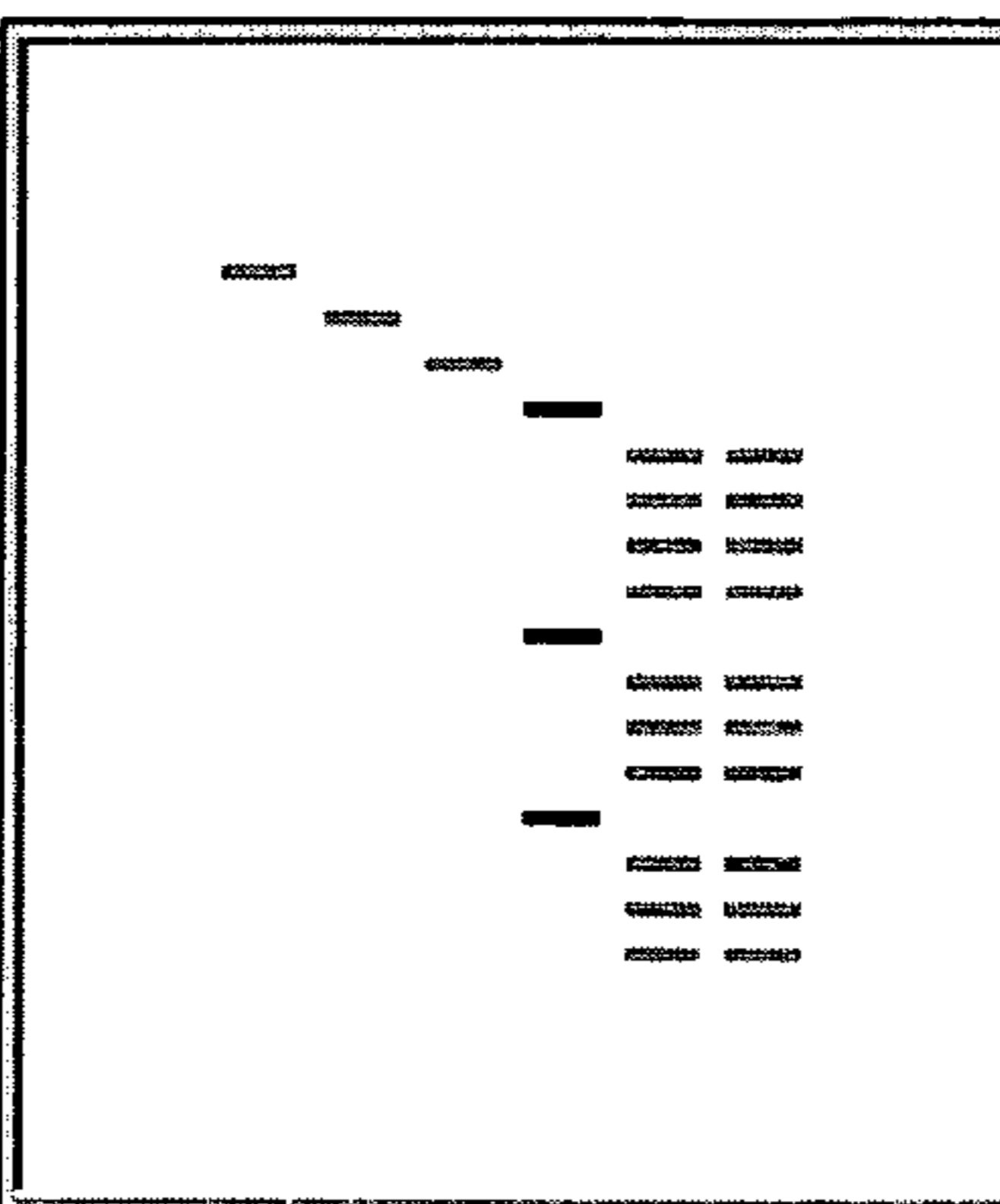
**Fig. 13A**



**Fig. 13B**



**Fig. 13C**



**Fig. 13D**

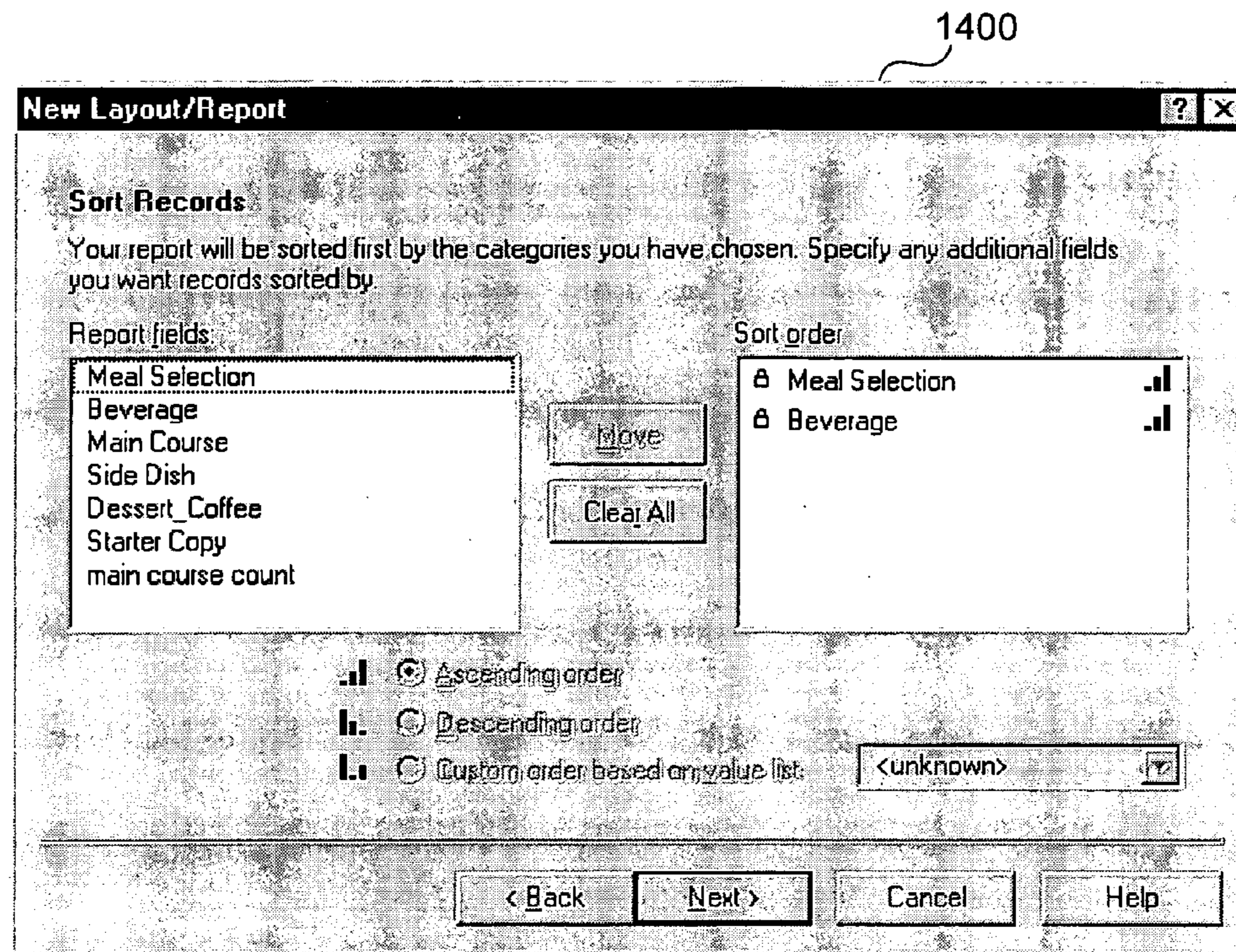


Fig. 14

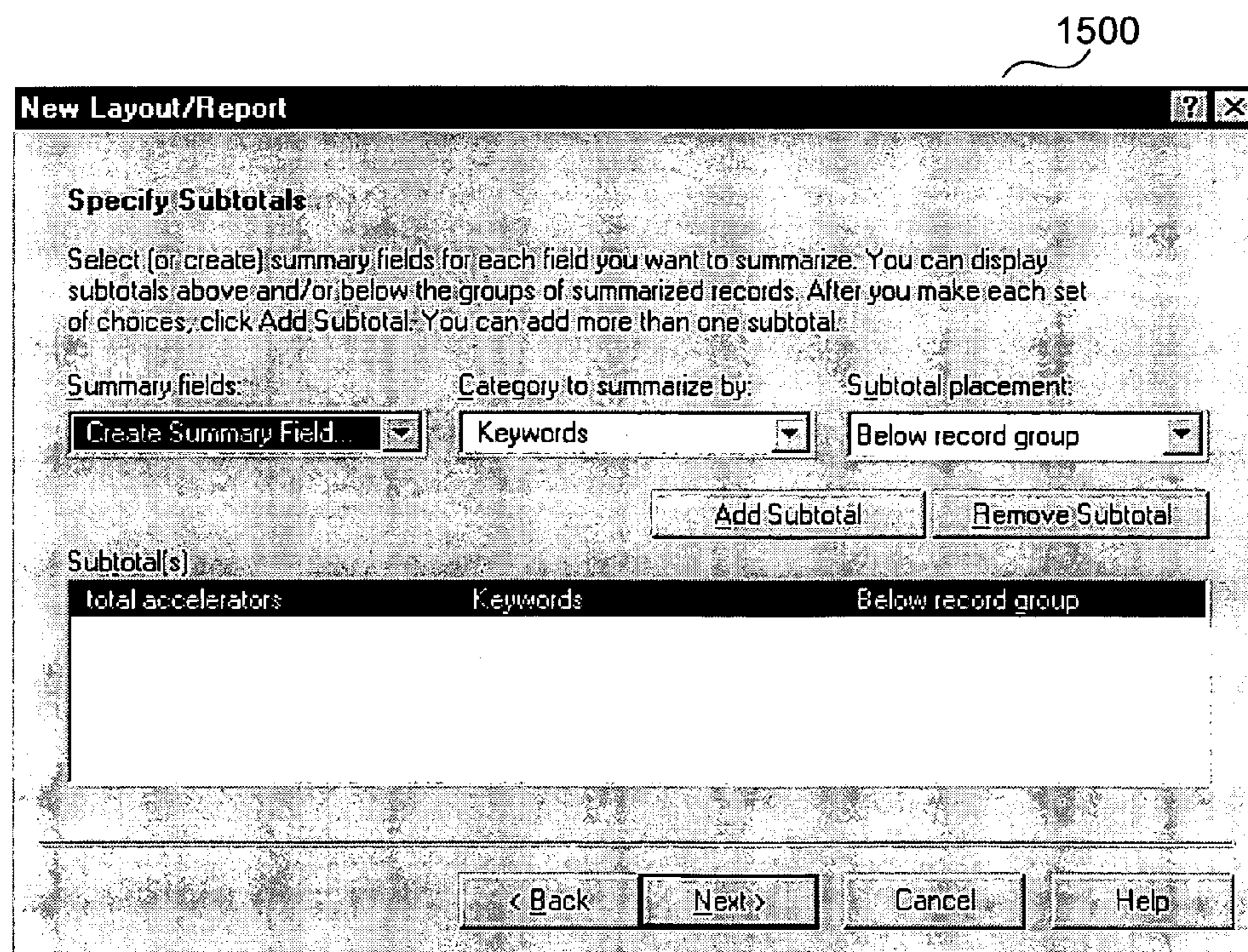


Fig. 15

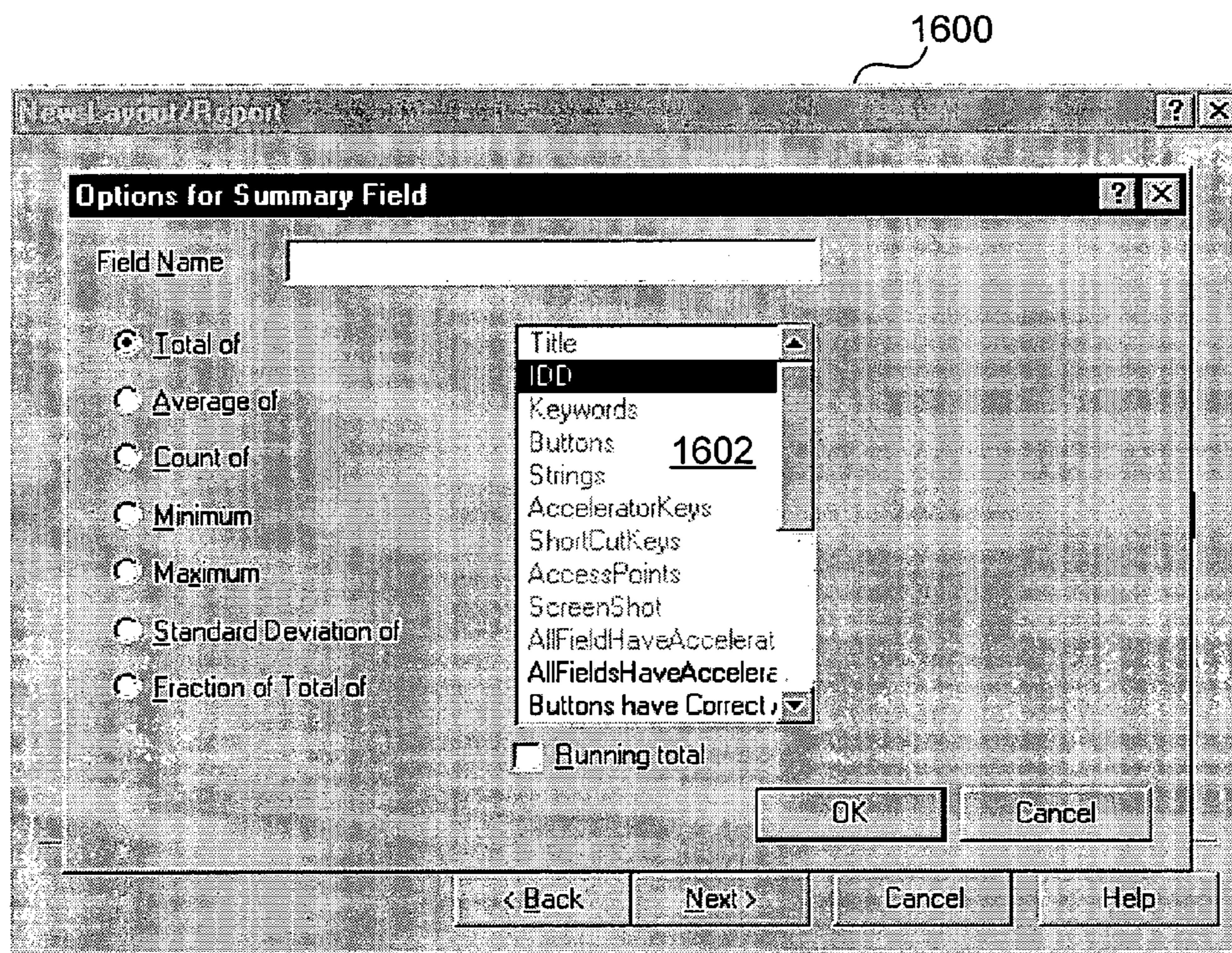


Fig. 16

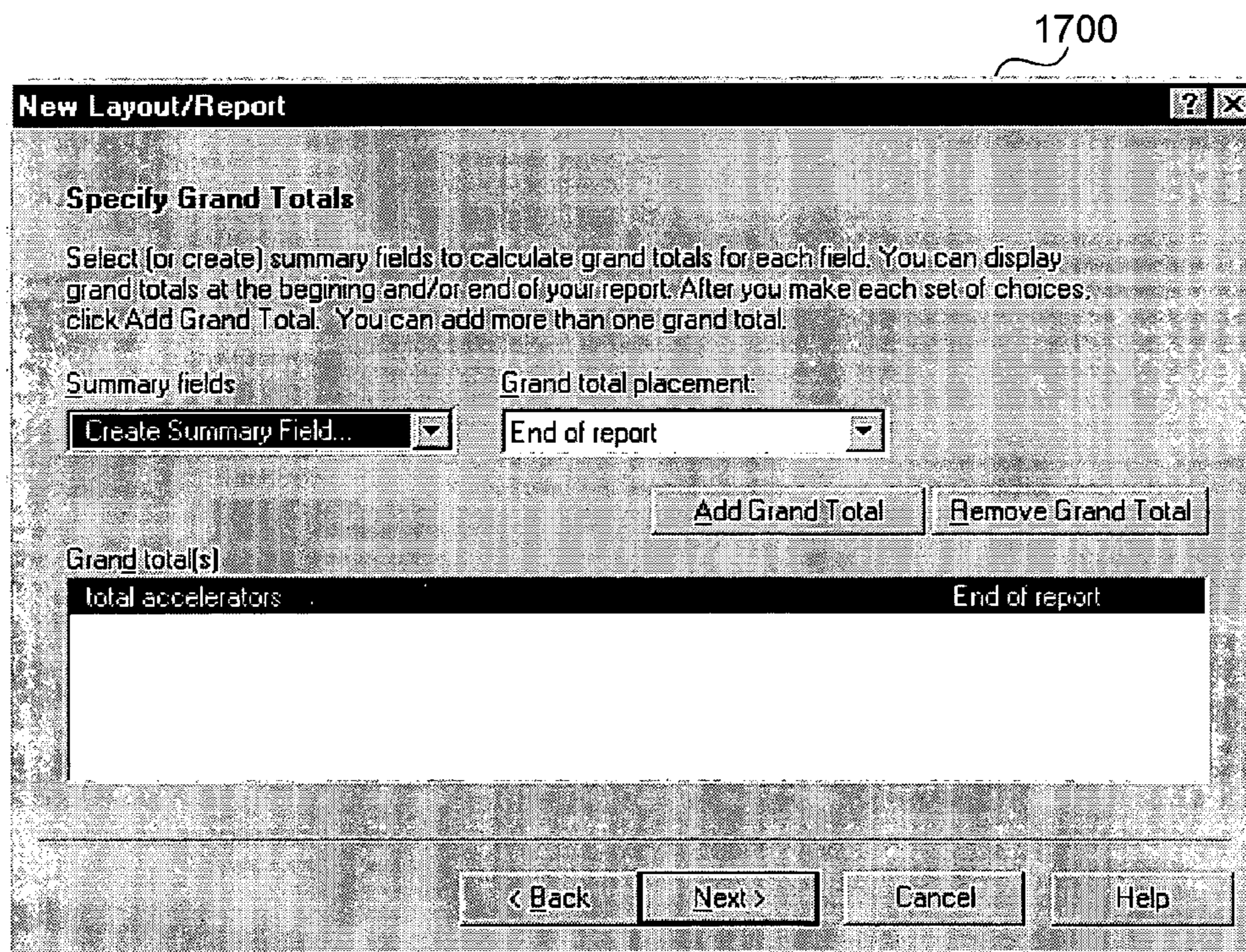


Fig. 17



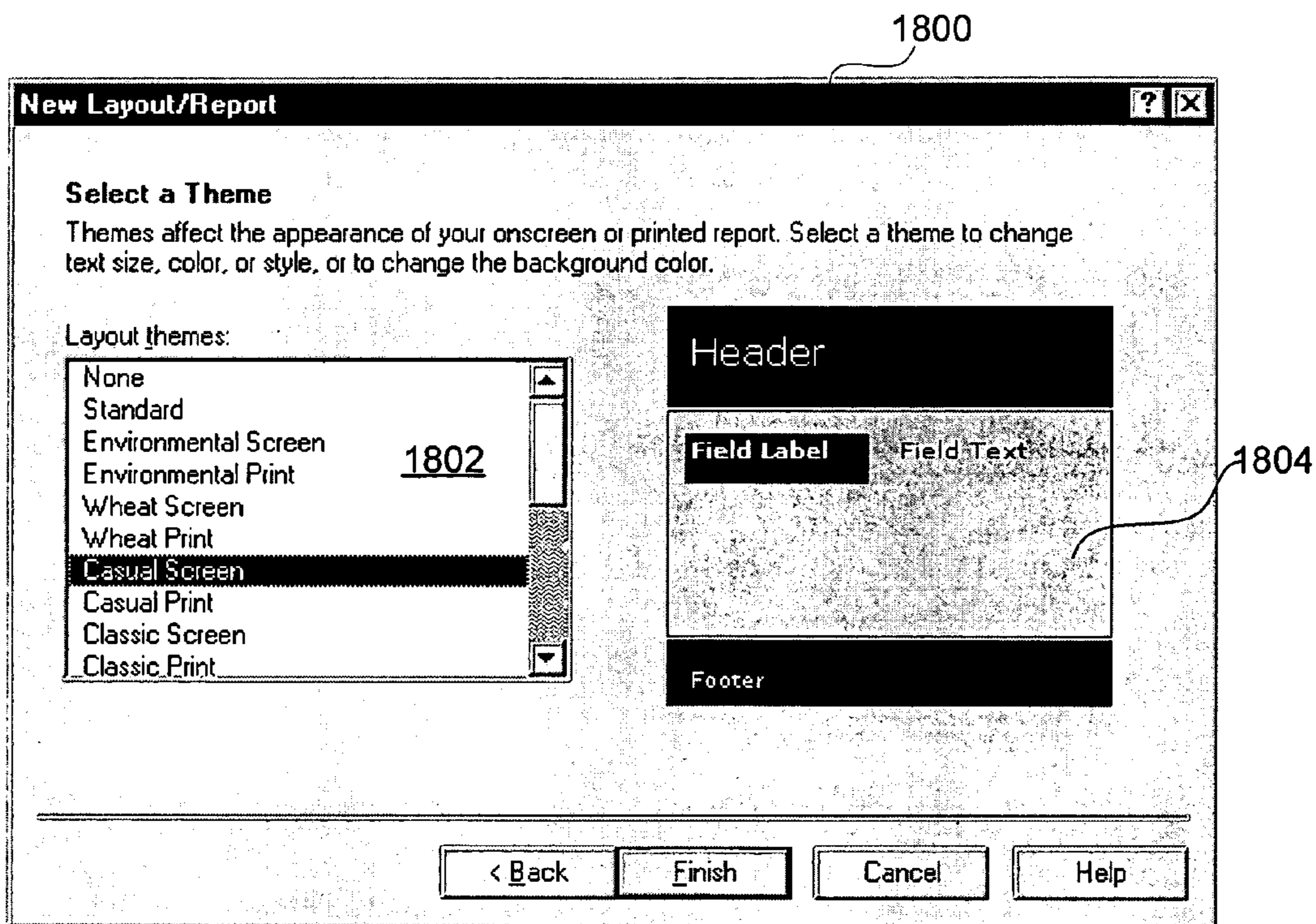


Fig. 18

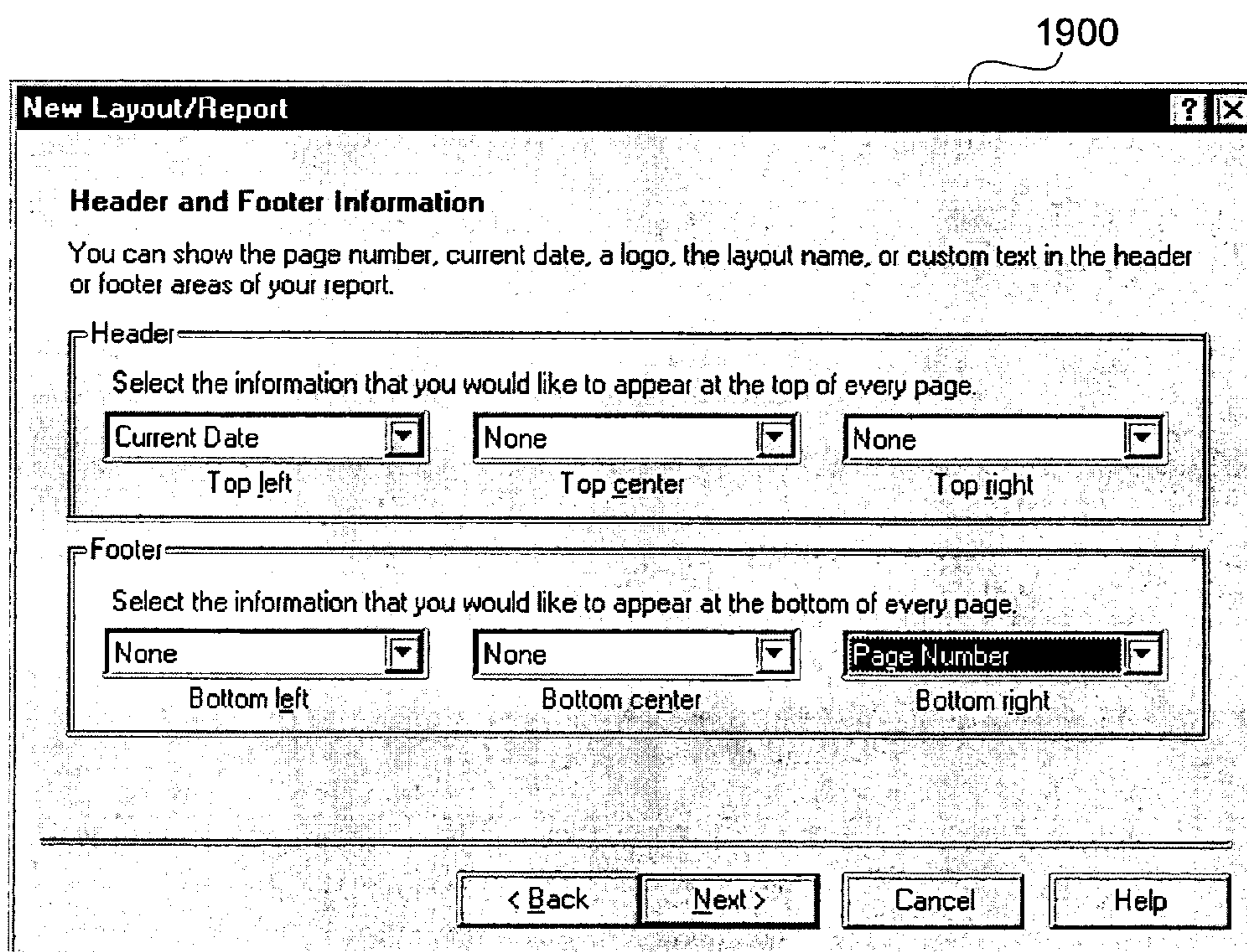


Fig. 19

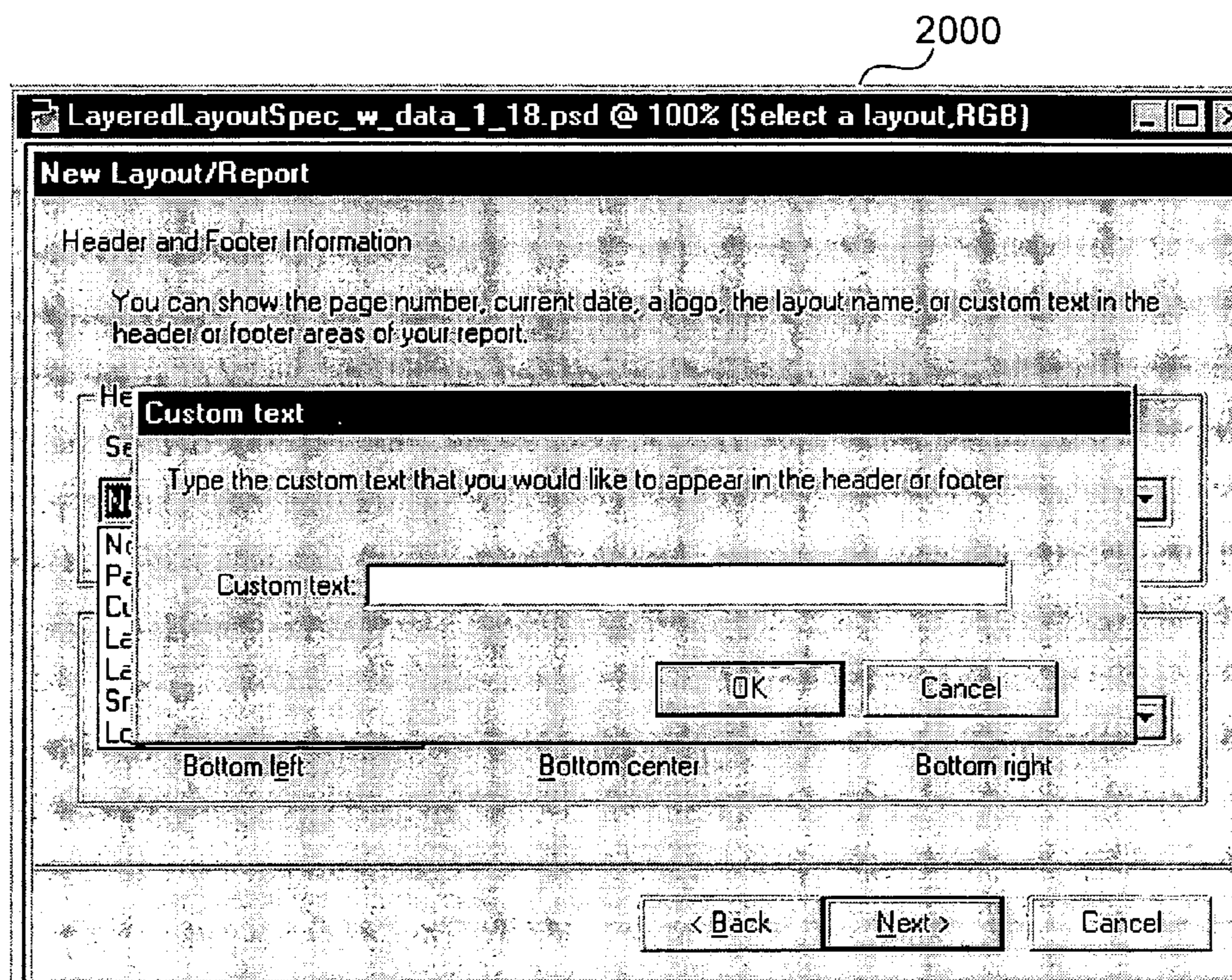


Fig. 20

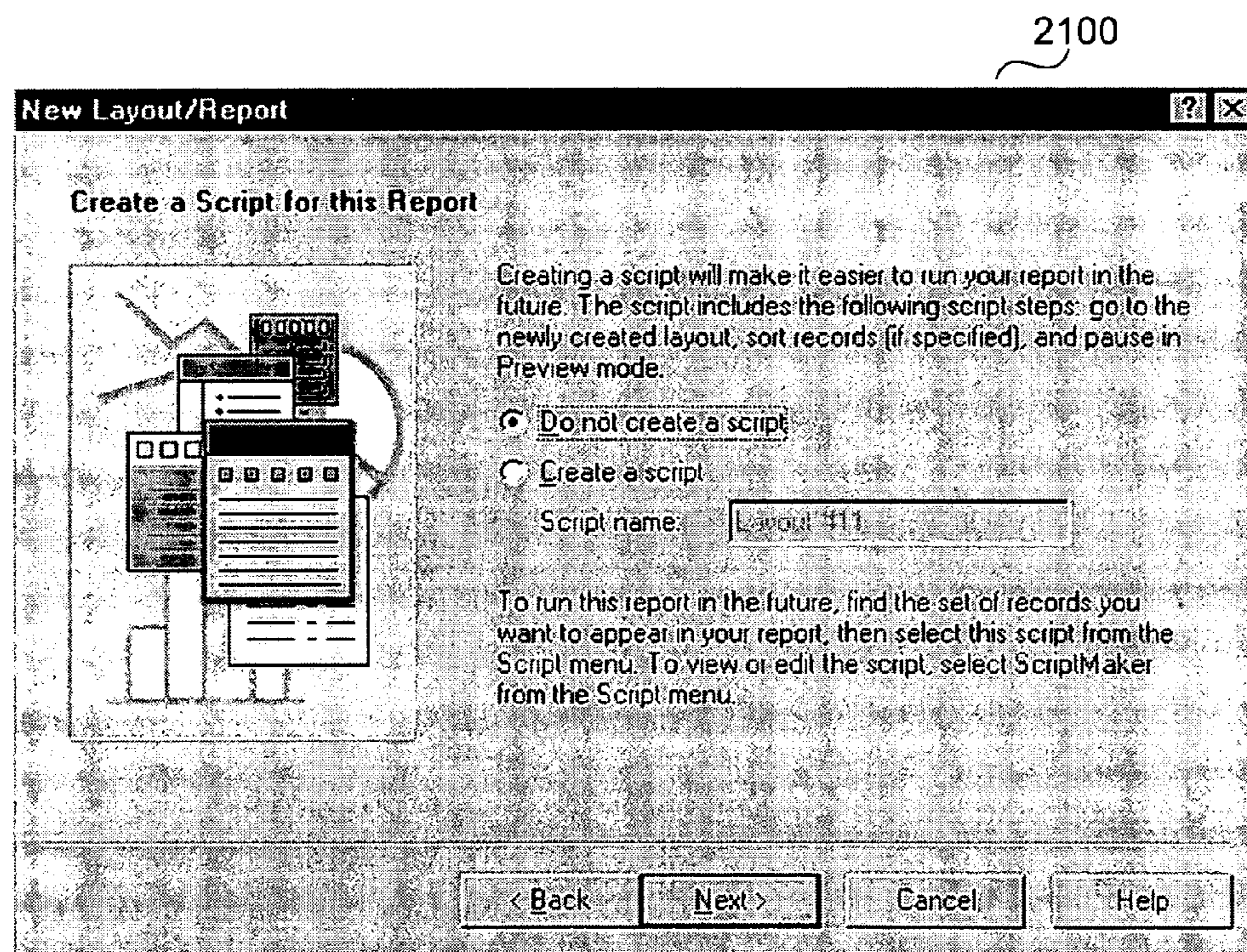


Fig. 21

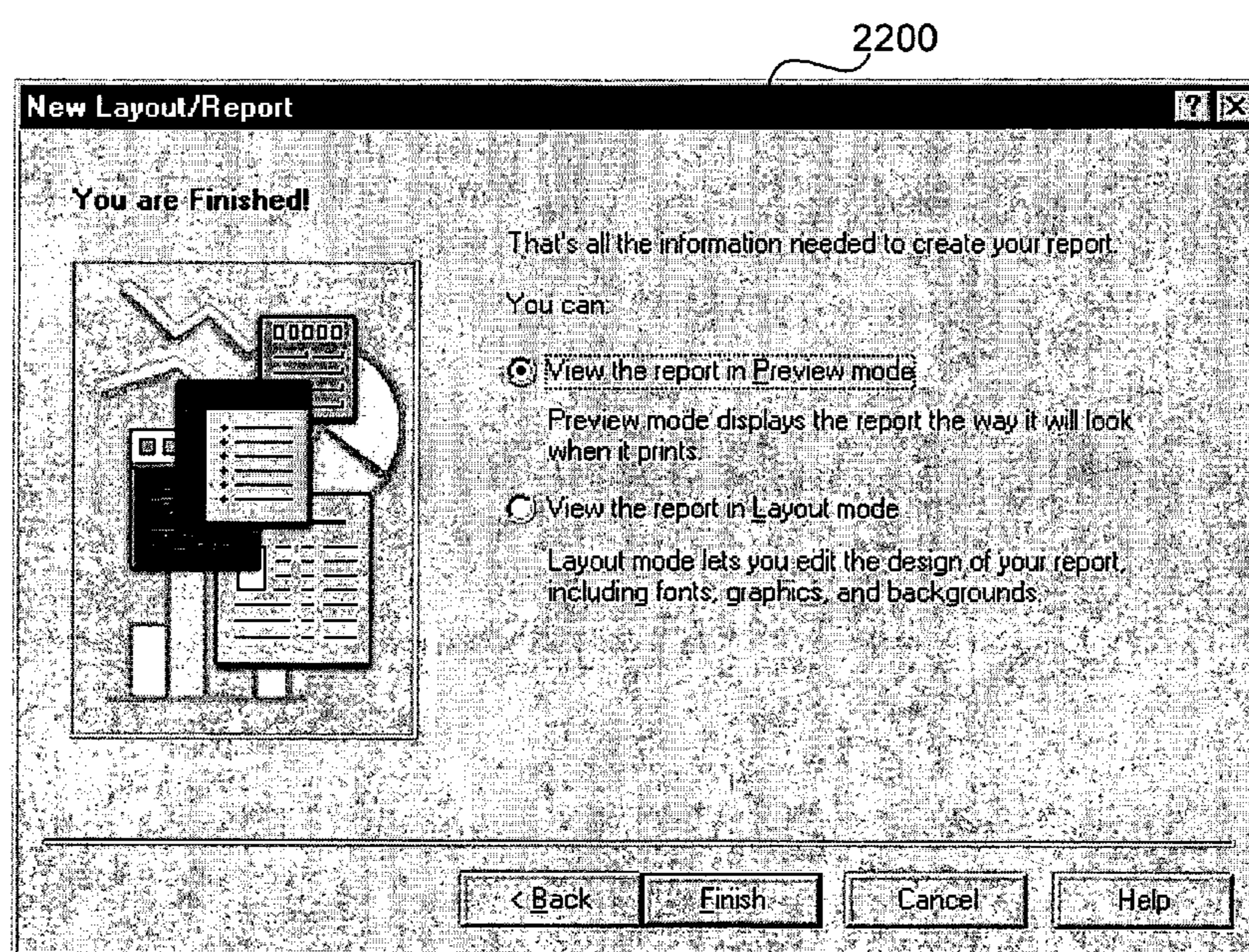


Fig. 22

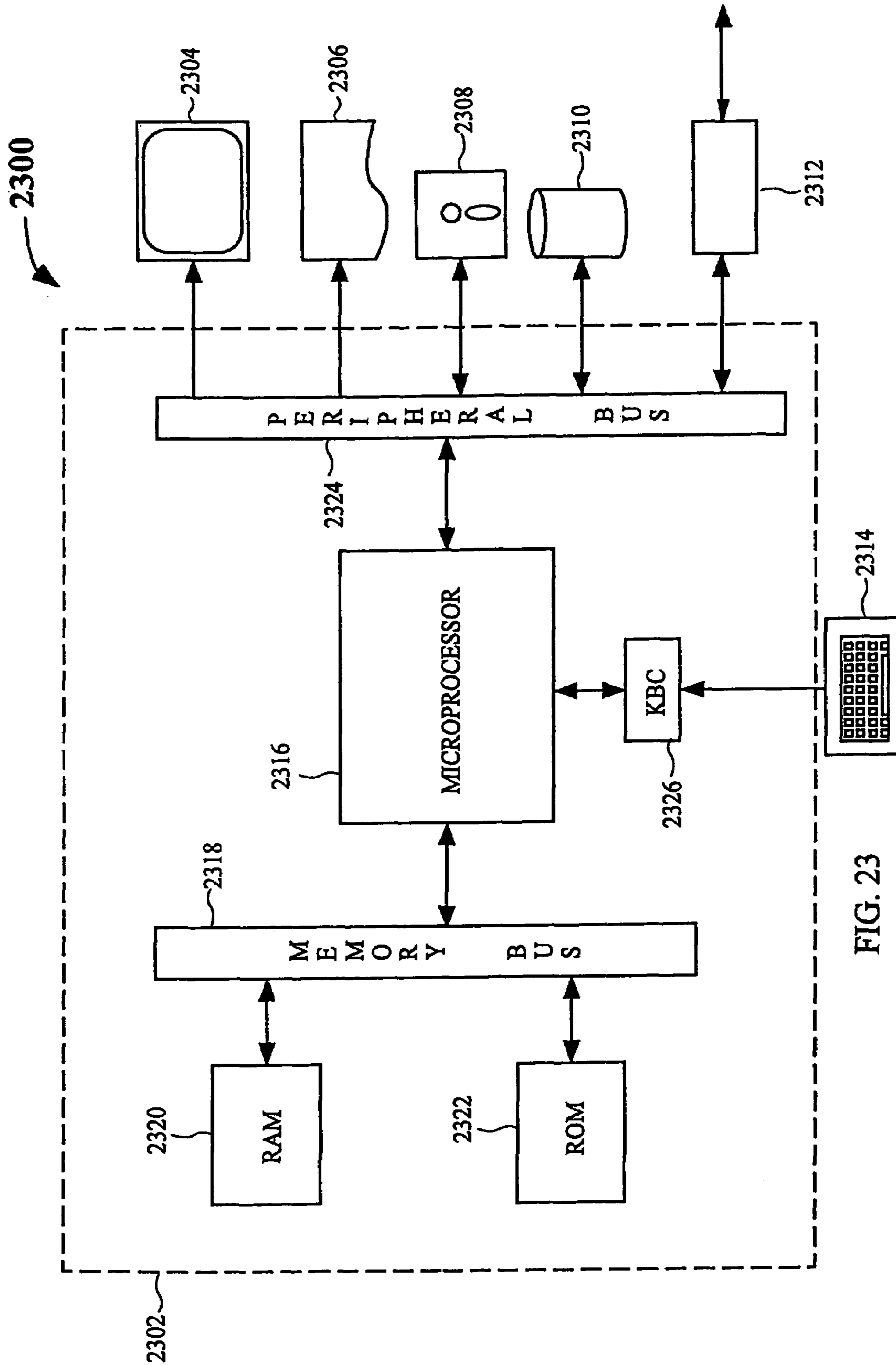


FIG. 23

## ASSISTANT FOR CREATION OF LAYOUTS OR REPORTS FOR DATABASES

### CROSS-REFERENCE TO RELATED APPLICATION

This application is related to U.S. patent application Ser. No. 09/378,599, filed concurrently herewith, entitled "PROCESS AND SYSTEM FOR PROVIDING A TABLE VIEW OF A FORM LAYOUT FOR A DATABASE", and assigned to the assignee of the present application, and hereby incorporated by reference for all purposes.

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### BACKGROUND OF THE INVENTION

#### 1. Field of the Invention

The present invention relates to databases and, more particularly, to visual presentation of information stored in databases.

#### 2. Description of the Related Art

Databases are used to store data in a manner that facilitates subsequent use of the data. A database includes one or more files, each of which contains one or more records. A record holds information about a subject or item in various fields of the record. Often database programs provide a user interface that allows a user to view the data in various ways. For example, the visual representations can include browse mode, layout mode, and preview mode. The browse mode allows records to be viewed, changed, sorted, deleted, or added. The layout mode allows one to define how the information of the database is presented on a computer screen or in printed reports. The preview mode allows one to see on a computer screen how data in records, forms or reports will look when printed.

FIGS. 1-3 are representative screen depictions from a conventional database program, namely, FileMaker Pro 4.0 by FileMaker Pro, Inc. of Santa Clara, Calif. The screen depictions pertain to an asset management database having three records. FIG. 1 illustrates a screen depiction of a browse mode for record "1" of the asset management database. The browse mode is suitable for on-line or screen viewing of the records of the asset management database and allows the records to be viewed or deleted. The data in the fields of the record can be changed, sorted, deleted or added in the browse mode. In FIG. 1, the record "1" is viewed as a form but may also be viewed as a list. FIG. 2 illustrates a screen depiction of a preview mode for the asset management database. The preview mode illustrates the asset management database on the computer screen in a manner that it would appear when printed. FIG. 3 illustrates a screen depiction of a layout mode for the asset management database. Typically, a database can have different layouts for different views and different reports. The layout mode depicted in FIG. 3 pertains to a depreciation report to be used with the asset management database.

Hence, with FileMaker Pro 4.0, the report layout, such as shown in FIG. 3, can be designed by a user or software

developer to provide the particular type of report the user or developer desires. The layout mode typically provides various controls or tools that enable the user or software developer to design reports. The form view layout can also be designed in a similar manner. One problem is that it has been difficult for users or developers to create sophisticated reports using the layout mode. These difficulties not only frustrate users and hinder user satisfaction but also make the generation of sophisticated reports overly burdensome. As a consequence, the producer of FileMaker Pro 4.0 has experienced a significant number of technical inquiries from users or software developers pertaining to difficulties regarding use of the layout mode to create sophisticated reports.

Accordingly, there is a need for improved ways to provide layouts for reports.

### SUMMARY OF THE INVENTION

Broadly speaking, the invention relates to an assistant for the creation of layouts/reports for databases. A layout for a database is the arrangement of information for the database such as for data entry or screen viewing, and a report (or report format) for a database is the arrangement of information from the database for presentation of the data in a printed document or with on-line viewing. The assistant serves to automate in the creation of the layout/reports after an interview sequence with a user.

The invention can be implemented in numerous ways including, as a method, an apparatus, a computer readable medium, and a computer system. Several embodiments of the invention are discussed below.

As a method for creating a report or layout for data stored in a database, one embodiment of the invention includes the acts of: (a) performing an interview sequence to obtain organization information, the organization information including at least a list of fields and at least one summary field for the report or layout, the at least one summary field being associated with one of the fields in the list of fields; and (b) automatically creating the report or layout based on the interview sequence.

As a method for creating a report layout for data stored in a database, another embodiment of the invention includes the acts of: (a) performing an interview sequence to obtain organization information, the organization information including at least a list of fields and at least one summary field for the report layout, the at least one summary field being associated with one of the fields in the list of fields, the report layout including a plurality of parts including a header area, a grand total area, a summary area, a body area, and a footer area; and (b) automatically creating the report layout based on the interview sequence, said creating includes placing the summary field in at least one of the grand total area and the summary area, and placing the fields in the list of fields in the body area.

As a computer readable medium including computer program code for creating a report layout for data stored in a database, one embodiment of the invention includes: computer program code for performing an interview sequence to obtain organization information, the organization information including at least a list of fields and at least one summary field for the report layout, the at least one summary field being associated with one of the fields in the list of fields, the report layout including a plurality of parts including a header area, a grand total area, a summary area, a body area, and a footer area; and computer program code for creating the report layout based on the interview sequence, the creating of the report layout includes placing

the summary field in at least one of the grand total area and the summary area and placing the fields in the list of fields in the body area.

The advantages of the invention are numerous. Different embodiments or implementations may yield one or more of the following advantages. One advantage of the invention is that sophisticated layouts/reports are able to be created in an automated manner. Another advantage of the invention is that header and footers, styles, sorts, and summary fields can be provided within the layout/reports. Still another advantage of the invention is that technical service inquiries concerning creation of sophisticated reports can be significantly reduced. Yet another advantage of the invention is that ease of use and user satisfaction are improved.

Other aspects and advantages of the invention will become apparent from the following detailed description, taken in conjunction with the accompanying drawings, illustrating by way of example the principles of the invention.

### BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be readily understood by the following detailed description in conjunction with the accompanying drawings, wherein like reference numerals designate like structural elements, and in which:

FIGS. 1–3 are representative screen depictions from a conventional database program;

FIG. 4 is a flow diagram of layout/report wizard processing according to one embodiment of the invention;

FIGS. 5A and 5B are flow diagrams of create layout/report processing according to one embodiment of the invention;

FIG. 5C is a flow diagram of layout/report enhancement processing according to one embodiment of the invention;

FIG. 6 is a flow diagram of grand total processing according to one embodiment of the invention;

FIG. 7 is a flow diagram of subsummaries processing according to one embodiment of the invention; and

FIGS. 8–22 are a series of screen depictions that are associated with a representative example of an interview sequence according to an embodiment of the invention.

FIG. 23 is a block diagram of an exemplary computer system suitable for use with the invention.

### DETAILED DESCRIPTION OF THE INVENTION

The invention relates to an assistant for the creation of layouts/reports for databases. A layout for a database is the arrangement of information for the database such as for data entry or screen viewing, and a report (or report format) for a database is the arrangement of information from the database for presentation of the data in a printed document or with on-line viewing. The assistant serves to automate in the creation of the layout/reports after an interview sequence with a user.

The assistant creates layouts or reports. A report is considered in this application to be a more sophisticated, or complex, layout. A report layout is interchangeable with report.

Embodiments of this aspect the invention are discussed below with reference to FIGS. 4–22. However, those skilled in the art will readily appreciate that the detailed description given herein with respect to these figures is for explanatory purposes as the invention extends beyond these limited embodiments.

FIG. 4 is a flow diagram of layout/report wizard processing 400 according to one embodiment of the invention. Once invoked, the layout/report wizard processing 400 initiates 402 a layout/report wizard. Typically, the initiation 402 of the layout/report wizard is done by a user action in selecting an icon or command associated with the layout/report wizard. The icon or command are displayed on a display screen for a computer executing a program including the layout/report wizard. A temporary node in a temporary file and a temporary data structure are then created 404. The temporary node stores fields and parts information and the temporary data structure stores layout/report information from the interview sequence.

Next, an interview sequence of the layout/report wizard is performed 406. The interview sequence operates to interview the user of the layout/report wizard to present the user with various options and selections to be made so as to produce the desired layout or report. FIGS. 8–22, described below, are a series of screen depictions that are associated with a representative example of the interview sequence. During the interview sequence, data is stored to the temporary file and the temporary data structure based on the information obtained from the user during the interview sequence.

After the interview sequence has been performed 406, the layout/report can be created 408. When creating the layout/report, the layout/report wizard processing 400 utilizes the data stored in the temporary file and the temporary data structure. After the layout/report has been created 408, the layout/report is saved 410. Then, the temporary node and the temporary data structure are deleted 412. The layout/report wizard processing 400 is then complete and ends.

The layout/report being created can be organized by layout parts which together form the layout/report. Exemplary layout parts for a layout/report are provided in Table 1 below.

TABLE 1

#### LAYOUT PARTS

Title Header
Header
Leading Grand Totals
Leading Summaries
Body
Trailing Summaries
Trailing Grand Totals
Footer
Title Footer

The exemplary layout parts provided in Table 1 include Title Header, Header, Leading Grand Totals, Leading Summaries (or Leading Subsummaries), Body, Trailing Summaries (or Trailing Subsummaries), Trailing Grand Totals, Footer, and Title Footer. The layout/report wizard serves to create and place information or fields in those of the exemplary parts being used by the layout/report. In the embodiment discussed below, the Title Header and the Title Footer are not used but these any of the other layout parts are modifiable by user actions following the operation of the layout/report wizard.

FIGS. 5A and 5B are flow diagrams of create layout/report processing 500 according to one embodiment of the invention. The create layout/report processing 500 is, for example, associated with operations performed by block 408 illustrated in FIG. 4.

The create layout/report processing **500** initially reads **502** the temporary file. As noted above, the layout/report wizard processing **400** creates a temporary file and updates the temporary file in accordance with information obtained from the interview sequence. Similarly, the temporary data structure is created during the layout/report wizard processing **400** and the temporary data structure is likewise updated in accordance with information obtained from the interview sequence. After the temporary file has been read **502**, a decision **504** determines whether a header is needed. When the decision **504** determines that a header is needed, then the header is created **506**. On the other hand, when the decision **504** determines that a header is not needed, the creation **506** of the header is bypassed.

Following the creation **506** of the header or directly following the decision **504** when a header is not needed, a decision **508** determines whether a body is needed. When the decision **508** determines that a layout/report being created does not include a body, then the body is not needed and the create layout/report processing **500** skips all the processing associated with the body (e.g., blocks **520–534**). On the other hand, when the decision **508** determines that the body is needed, then various operations are performed to create the body and provide various components for the body. In particular, when the decision **508** determines that the body is needed, the position of fields for the body are determined **512**. Fields are not actually placed within the body at this time, but their positions within the body are determined. The order in which the fields are placed are determined by a specified order for the fields during the interview sequence. For example, in FIG. **11**, the user would identify the fields to appear in the layout/report and their order.

A decision **514** then determines whether there are any leading grand totals for the layout/report. When the decision **514** determines that there are leading grand totals, then the leading grand totals are placed **516** in the appropriate leading grand totals layout part. When the decision **514** determines that there are no leading grand totals, the placement **516** of the leading grand totals is bypassed. Following the placement **516** of the leading grand totals or directly following the decision **514**, a decision **518** determines whether there are any leading subsummaries. When the decision **518** determines that there are leading subsummaries, the leading subsummaries are placed **520** in the appropriate leading subsummaries layout part. On the other hand, when the decision **518** determines that there are no leading subsummaries, the placement **520** of the subsummaries is bypassed.

Following the placement **520** of the subsummaries or directly following the decision **518**, a decision **522** determines whether the layout/report includes the body. When the layout/report does include a body, then the fields are placed **524** in the body at appropriate positions. The appropriate positions were determined in block **512** above. After the fields are placed **524** in the body, the field names are placed **526** in the header. The field names are placed **526** in the appropriate locations such that they are associated with the corresponding fields in the body. Typically, a field is placed in a column location of a report, and the field name would then be placed in the same column location typically above the data for the field. When the decision **522** determines that the layout/report does not include a body, the placement **524** of the fields in the body and the placement **526** of the field names are bypassed.

Following the placement **526** of the field names or directly following the decision **522** when the layout/report does not include a body, a decision **528** determines if there

are any trailing subsummaries. When the decision **528** determines that there are trailing subsummaries, then trailing subsummaries are placed **530** in the appropriate trailing subsummaries layout part. When the decision **528** determines that there are no trailing subsummaries, the placement **530** of the trailing subsummaries is bypassed.

Following the placement **530** of the trailing subsummaries or directly following the decision **528**, a decision **532** determines whether there are any trailing grand totals. When the decision **532** determines that there are trailing grand totals, then the trailing grand totals are placed **534** in the appropriate trailing grand totals layout part. Following the placement **534** of the trailing grand totals or directly following the decision **532**, a decision **536** determines whether a footer is needed. When the decision **536** determines that a footer is needed, the footer is created **538**. On the other hand, when the decision **536** determines that no footers are needed, the creation **538** of the footers is bypassed.

Following the creation **538** of the footer or directly following the decision **536** when the footer is not needed, a decision **540** determines whether a layout mode or a preview mode has been selected. When the decision **540** determines that a layout mode has been selected, then the layout/report is displayed **542** in a layout mode. Alternatively, when the decision **540** determines that the preview mode has been selected, the database is sorted **544** based on the sort order. By sorting the database, the data provided within the report is updated and displayed in its appropriate order. Then, the report can be displayed **546** in the preview mode. Following blocks **542** and **546**, the create layout/report processing **500** is complete and ends.

FIG. **5C** is a flow diagram of layout/report enhancement processing **550** according to one embodiment of the invention. The layout/report enhancement processing **550** pertains to additional operations that the create layout/report processing **500** could perform. Namely, a theme for the layout/report can be set **552**. The theme, or style, for the report/layout operates to cause text size, text color, text font, text style, and background color to be changed in accordance with the theme. The theme can also alter effects of the layout/report (e.g., text or fields), such as embossing, engraving, or shadowing. Selection of a theme is done during the interview sequence and is much more efficient than individually selecting color and fonts for the various components of a layout/report. The layout/report enhancement processing **550** can also automatically create a script for the layout/report during its creation so that the layout/report can be easily initiated for subsequent data sets to be placed in the layout/report. In particular, a decision **554** determines whether a script is requested. When the decision **554** determines that a script is requested, then the script is created **556** for the layout/report. On the other hand, when the decision **554** determines that a script is not requested, the block **556** is bypassed. The layout/report enhancement processing **550** is thereafter complete and ends.

FIG. **6** is a flow diagram of grand total processing **600** according to one embodiment of the invention. The grand total processing **600** is, for example, processing that can be performed to place either leading grand totals or trailing grand totals such as performed in blocks **516** and **534** of the create layout/report processing **500** illustrated in FIGS. **5A** and **5B**.

The grand total processing **600** begins with a decision **602** that determines whether a body is present in the layout/report. When the decision **602** determines that a body is not present, then the grand total can be placed **604** at the leftmost position in the grand total area. Typically, at the very

leftmost position, there may be break fields for labels, images, or other content. Break fields are associated with categories (see FIG. 12), and for example, identify the categories to be sort the data on. Hence, the placement **604** of the grand total at the leftmost position need not be at the very left position of the layout/report. The grand total is placed **604** in the grand total area which is a reserved section or part of the layout/report. If, for example, there is no body part, then the grand total will be placed in the same column location as the same field which was previously placed when the same field was previously placed. The grand total area, for example, is either the leading grand total part or the trailing grand total part. After the placement **604** of the grand total, the grand total processing **600** is complete and ends.

Alternatively, when the decision **602** determines that a body is present in the layout/report, then a decision **606** determines whether the grand total to be placed is dependent on a field to be placed (e.g., in the body). When the decision **606** determines that the grand total is not dependent on a field to be placed, then the grand total processing **600** places the grand total in accordance with block **604**. On the other hand, when the decision **606** determines that the grand total to be placed is dependent on a field to be placed, then the grand total is placed **608** in the grand total area at the same position as the associated previously placed field. For example, if a grand total operates to total the field "sales", and the grand total is paced such that it is aligned (e.g., in the same column) with the sales field which was previously placed. Following block **608**, the grand total processing **600** is complete and ends.

FIG. 7 is a flow diagram of subsummaries processing **700** according to one embodiment of the invention. The subsummaries processing **700** is, for example, the processing performed when placing the leading or trailing subsummaries within the layout/report being produced by the layout/report wizard. More particularly, the subsummaries processing **700** is processing performed during the block **520** and **530** of the create layout/report processing **500** illustrated in FIGS. 5A and 5B.

The subsummaries processing **700** begins with a decision **702** that determines whether a body (e.g., a body part) is present in the layout/report. When the decision **702** determines that the layout/report does not include a body, then the subsummary (i.e., summary field) is placed **703** (i) at the same position as a previously placed like subsummary, or (ii) at the next available rightmost position if there is no previously placed like subsummary.

Alternatively, when the decision **702** determines that the layout/report does include a body, a decision **704** determines whether the subsummary (i.e., summary field) is dependent on a previously placed, or to be placed, field in the body. When the decision **704** determines that the subsummary is dependent on a previously placed, or to be placed, field in the body, then the subsummary is placed **706** in the subsummaries area (i.e., subsummaries layout part) at the same position as the associated previously placed, or to be placed, field. For example, the subsummary will be placed in the same column as the associated previously placed field but in the subsummaries area. The subsummaries area is a reserved section or part of the layout/report. The subsummaries area, for example, is either the leading summaries part or the trailing summaries part.

On the other hand, when the decision **704** determines that the subsummary is not dependent on a previously placed, or to be placed, field in the body, then a decision **708** determines whether the subsummary is dependent on a previously placed field in an area (e.g., part) other than the body. For

example, the previously placed field could be in the leading grand total or leading summary or trailing summary layout parts. When the decision **708** determines that the subsummary is dependent on a previously placed field in an area other than the body, the subsummary is placed **710** at the same position as the associated previously placed field. For example, the subsummary will be placed in the same column as the associated previously placed field but in the subsummaries area. Alternatively, when the decision **708** determines that the subsummary is not dependent on a previously placed field in an area other than the body, the subsummary is placed **712** at the next available rightmost position.

Following blocks **703**, **706**, **710** and **712**, a decision **714** determines whether there are more subsummaries to be placed. When the decision **714** determines that there are more subsummaries to be placed, the subsummaries processing **700** returns to repeat the decision **704** and subsequent blocks so that other of the subsummaries can be processed. However, when the decision **714** determines that there are no more subsummaries to be processed, the subsummary processing **700** is complete and ends.

FIGS. 8–22 are a series of screen depictions that are associated with a representative example of the interview sequence according to one implementation of the invention. During the interview sequence, data is stored to the temporary file and the temporary data structure based on the information obtained from the user during the interview sequence.

FIG. 8 is a screen depiction of a screen **800** in which a user selects a layout type and provides a layout name for the layout/report to be produced by the layout/report wizard. As shown in FIG. 8, the available layout types include: Standard Form, Columnar Lists/Report, Table View, Labels, Envelope, and Blank Layout. The discussion of the subsequent screen depictions in FIGS. 9–22 assumes that the user has selected to create a Columnar List/Report type of layout. The Columnar List/Report type of layout is considered a report, whereas the other layout types are considered layouts. Again, a report is considered to be a more sophisticated, or complex, layout. Hence, all the available layout types can be considered layouts. Since the subsequent screen depictions pertain to the Columnar List/Report type of layout, the layout/report wizard is mainly described as producing a report.

FIG. 9 illustrates a screen depiction of a screen **900** in which a report layout is chosen. The screen **900** follows after the screen **800** in the interview sequence. In the screen **900**, a user can select, via radio buttons, either a Columnar List/Report or a Report with Grouped Data. The Columnar List/Report selection is used to create a basic columnar report. The Report with Grouped Data selection is used to create a complex report in an extended columnar layout. When the Report with Grouped Data selection is chosen, check boxes allow the inclusion of subtotals or grand totals within the complex report having the extended columnar layout that is to be created. The discussion of the subsequent screen depictions (FIGS. 10–22) assumes that the user has selected to create the Report with Grouped Data with both subtotals and grand totals. Given that this is the most complicated of the reports that be created, it in effect also describes other reports.

FIGS. 10A–10D are representative layout arrangements for the chosen report. In the screen **900**, the illustrated representative layout arrangement in window **902** is a Columnar List/Report which extends beyond the page margins. This illustrated representative layout arrangement in the window **902**, however, changes as different one of the



radio buttons or check boxes are selected in the screen **900**. In other words, the window **902** in the screen **900** could alternatively include any of the layout arrangements shown in FIGS. **10A–10D**. FIG. **10A** is a representative layout arrangement for a report with grouped data without any subtotals or grand totals. FIG. **10B** is a representative layout arrangement for a report with grouped data with subtotals. FIG. **10C** is a representative layout arrangement for a report with grouped data with grand totals. FIG. **10D** is a representative layout arrangement for a report with grouped data with subtotals and grand totals.

FIG. **11** is a screen depiction of a screen **1100** in which fields for the layout/report are specified. The screen **1100** follows after the screen **900** in the interview sequence. The available fields within a selected database file are displayed in a list box **1102**. For example, in FIG. **11**, the available fields within the list box **1102** are associated with Graphical User Interface (GUI) components and include: Title, IDD, Keywords, Buttons, Strings, AcceleratorKeys, ShortCut-Keys, AccessPoints, ScreenShot, etc. A user can interact with the screen **1100** to select those of the available fields desirous of being layout fields for the layout/report. The selected one of the available fields then become the layout fields which are displayed in FIG. **11**. The order in which the fields are placed or selected is the order in which they will appear in the layout/report.

FIG. **12** is a screen depiction of a screen **1200** in which the organization of the report can be categorized (or grouped) by single category or hierarchy of categories. In particular, a user can select from the listed available report fields in a list box **1102** to indicate a report category. The available report fields are those fields that were selected in the screen **1100** illustrated in FIG. **11**. In the screen **1200**, the user has selected two of the report fields, Keywords and IDD, as report categories as shown in categories window **1204**, and thus the layout for the report is depicted in the window **1204** as having two categories arranged in a hierarchy. More generally, the report organization is shown in the window **1204** based on the number of categories selected (e.g., up to six levels of categories). FIGS. **13A–13D** are depictions of arrangements of the layout for the report in accordance with the hierarchy of categories selected. The report organization provided in the window **1204** also changes as different number of report categories are selected (window **1202**). In FIG. **13A** there is no hierarchy or categories selected and, thus, no organization in accordance with categories. In FIG. **13B** the arrangement of the layout is in accordance with the single category. In FIG. **13C** the arrangement of the layout is in accordance with a hierarchy of three categories. In FIG. **13D** the arrangement of the layout is in accordance with a hierarchy of four categories.

FIG. **14** is a screen depiction of a screen **1400** in which one or more fields on which records are to be sorted can be selected. The screen **1400** can follow after the screen **1200** in the interview sequence. Although the report will be initially sorted by the categories chosen with respect the screen **1200** illustrated in FIG. **12**, additional fields (layout fields) on which records are to be sorted can also be selected using the screen **1400**. In this example, the database being considered has to do with meal service instead of the GUI components as are utilized in other of the screen depictions. In addition, the screen **1400** allows the user to select whether the sort for the additional fields should be performed in accordance with an ascending order, a descending order, or a custom order based on a value list.

FIG. **15** is a screen depiction of a screen **1500** in which a user can setup subtotals for the report. The screen **1500** can

follow after the screen **1400** in the interview sequence. Using the screen **1500**, a user can select an existing summary field or create a new summary field for each field to be summarized. A new summary field can be created using the “Create Summary Field” item in the summary field list. These summary fields perform a mathematical operation to yield a subtotal. The screen **1500** also permits selection of a category to summarize and/or the placement of the subtotal either above or below the records being grouped.

FIG. **16** is a screen depiction of the screen **1600** that corresponds to the creation of a summary field. In other words, when the user selects the “Create Summary Field” item in the summary field list of the screen **1500** illustrated in FIG. **15**, the screen **1600** is presented. A user then selects from the fields of the current database that are listed in a list box **1602**, provides a name for the summary field, and indicates the type of summary operation being provided. The summary operations shown in the screen **1600** include: Total, Average, Count, Minimum, Maximum, Standard deviation, or Fraction of the Total. The total operation is used to create a summary field that serves to total the data for the selected field. The average operation is used to create a summary field that serves to average the data for the selected field. The count operation is used to create a summary field that serves to count the data for the selected field (e.g., counts the number of records in a set of records that contain data in the dependent field). The minimum operation is used to create a summary field that serves to return the minimum value found in the data for the selected field. The maximum operation is used to create a summary field that serves to return the maximum value found in the data for the selected field. The standard deviation operation is used to create a summary field that returns the standard deviation of the data for the selected field. The Fraction of the Total is used to create a summary field that returns the fraction of a total of the data for the selected field and an additional field. Only those of the fields in the list box **1602** that are appropriate for the selected summary operation are shown as active and able to be selected (i.e., inactive fields are not able to be selected). For example, only number, date and time fields can be totaled, whereas all fields can be counted.

FIG. **17** is a screen depiction of a screen **1700** in which grand totals can be specified. The screen **1400** can, for example, follow after the screen **1400** or **1500(1600)** in the interview sequence. Like the screen **1500** illustrated in FIG. **15**, the screen **1700** allows the user to select and position summary fields. Here, by placement in the grand totals area, the summary fields are used to calculate grand totals for the summary fields. These grand totals can be displayed at the beginning and/or the end of the report (i.e., leading grand totals layout part or trailing grand totals layout part). In FIG. **17**, the screen **1700** shows that the user has requested one grand total for the total accelerators summary field and that the grand total is to be placed at the end of the report.

FIG. **18** is a screen depiction of a screen **1800** in which a theme for the report can be selected. The screen **1800** can, for example, be flexibly placed in the interview sequence. The theme, or style, for the report operates to cause text size, text color and background color to be changed in accordance with the theme. A list box **1802** includes the theme options for the report. The list box in the screen **1800** includes the theme options of: None (default), Standard, Environmental Screen, Environmental Print, Wheat Screen, Wheat Print, Casual Screen, Casual Print, Classic Screen, Classic Print, etc. Some of the themes can be optimized for on-screen results and others can be optimized for printed results. A user

simply selects one of the themes and the report take on the attributes (e.g., colors, fonts, sizes) of the theme. As a different theme is selected, the sample style image in window **1804** is updated to reflect the selected theme.

FIG. **19** is a screen depiction of a screen **1900** in which header and footer information can be established. The screen **1900** can, for example, be flexibly placed in the interview sequence. For example, the header or footer information can include page number, current date, a logo, the layout/report name, or custom text. Upon selecting any of the pop-up menus for the header or footer at any of left, center or right positions, a menu of items available for selection is displayed. In one implementation, the menu of items includes page number, current date, layout name, large custom text, small custom text, and logo. The screen **1900** illustrates user selections such that (i) the Current Date is to be provided in the top left position of the header and (ii) the Page Number is to be provided in the bottom right position of the footer. If the large or small custom text menu items are selected, a custom text dialog is opened. FIG. **20** is a screen depiction of a screen **2000** in which a custom text dialog is opened over the screen **1900**. The custom text dialog allows a user to enter the particular custom text that will appear in the header or footer.

FIG. **21** is a screen depiction of a screen **2100** in which a script can requested during the interview sequence. In other words, a script can be automatically created by the layout/report assistant during the creation of the report. The screen **2100** can, for example, be flexibly placed in the interview sequence. By establishing a script for the report, the report is easier to run in the future because it will automatically be produced when the script is executed. In the case of a report such as the Columnar List/Report, the script can serve to properly sort the data in accordance with the report and provide proper totals. Hence, to subsequently use the script, the user would identify the set of records to appear in a report and then select the associated script for execution to thus produce the report. Hence, the data is not only placed in the desired report format but also sorted and suitably totaled. The script is created by a script engine Application Programming Interface (API) based on the user selections to the interview session and based on the particular type of layout being created.

FIG. **22** is a screen depiction of a screen **2200** in which a user has completed the interview session. At the screen **2200**, the user completes the creation of the report by selecting the mode to return to after the creation of the report. The screen **220** allows the user to return to either the preview mode or the layout mode. The preview mode displays the report as it will look when it is printed, and the layout mode allows the user the edit the design of the report to make further modifications or enhancements.

In general, the interview session associated with the Columnar List/Report is much more sophisticated than the interview session utilized for any of the Standard Form, The Table View, Labels, Envelopes or Blank Layout. For example, in creating a label layout, the user would be presented with a screen in which standard label measurements or custom label measurements can be selected, and then another screen would be presented to allow the user to build a label by selecting fields of the current database or type in additional text to be utilized for the content of the labels. The creation of an envelop layout is similar. Following the interview session, the layout for the labels or envelopes would allow the user to return to either the preview mode or the layout mode. In the case where a table

view layout is being created, following the interview session, the user is allowed to return to either the browse mode or the layout mode.

FIG. **23** is a block diagram of an exemplary computer system **2300** suitable for use with the invention. The computer system **2300** includes a digital computer **2302**, a display screen (computer screen or monitor) **2304**, a PC CARD slot **2306**, a floppy disk drive **2308**, a hard disk drive **2310**, media bay(s) **2312**, and a keyboard **2314**. The digital computer **2302** includes a microprocessor **2316**, a memory bus **2318**, random access memory (RAM) **2320**, read-only memory (ROM) **2322**, a peripheral bus **2324**, and a keyboard controller **2326**. The digital computer **2302** can be a personal computer, a workstation computer, or some other type of computer.

The microprocessor **2316** is a general purpose digital processor which controls the operation of the computer system **2300**. The microprocessor **2316** can be a single-chip processor or can be implemented with multiple components. Using instructions retrieved from memory, the microprocessor **2316** controls the reception and manipulation of input data and the output and display of data on output devices. According to the invention, as described above, some particular functions of the microprocessor **2316** are to present an interview sequence on the display screen **2304**, create a report/layout for a database in accordance with the results of the interview sequence, and produce reports from the report layout.

The memory bus **2318** is used by the microprocessor **2316** to access the RAM **2320** and the ROM **2322**. The RAM **2320** is used by the microprocessor **2316** as a general storage area and as scratch-pad memory. The ROM **2322** can be used to store instructions or program code followed by the microprocessor **2316** as well as other data.

The peripheral bus **2324** is used to access the input, output, and storage devices used by the digital computer **2302**. In the described embodiment, these devices include the display screen **2304**, the PC CARD slot **2306**, the floppy disk drive **2308**, the hard disk drive **2310**, and the media bay(s) **2312**. The keyboard controller **2326** is used to receive input from the keyboard **2314** and send decoded symbols for each pressed key to the microprocessor **2316**.

The display screen **2304** is an output device that displays images of data provided by the microprocessor **2316** via the peripheral bus **2324** or provided by other components in the computer system **2300**. The PC CARD slot **606** is a slot that is externally accessible (such as a slot on a housing of a portable computer) such that a PC CARD device can be inserted into the slot to provide the computer system with the additional resources available from the PC CARD device. The PC CARD device can also thereafter be removed from the slot of the computer system **2300**. Examples of types of PC CARD devices include a modem, additional memory, a network adapter, and processing hardware.

The floppy disk drive **2308** and the hard disk drive **2310** can be used to store various types of data. The floppy disk drive **2308** facilitates transporting such data to other computer systems, and hard disk drive **2310** permits fast access to large amounts of stored data. The hard disk drive can, for example, store a database that is associated with the layout/reports.

The microprocessor **2316** together with an operating system operate to execute computer code and produce and use data. The computer code and data may reside on the RAM **2320**, the ROM **2322**, or the hard disk drive **2320**. The computer code and data could also reside on a removable program medium and loaded or installed onto the computer

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system **2300** when needed. Removable program mediums include, for example, CD-ROM, PC-CARD, floppy disk, magnetic tape, and a network component.

The one or more media bays (expansion bays) **2312** are used to receive media bay devices (expansion bay devices) 5 to provide greater resources to the computer system. As examples, the types of devices include a floppy drive, a hard drive, a CD-ROM drive, a DVD drive, or a battery. The media bays are accessible from external to the computer system so that media bay devices can easily be inserted into 10 the media bays or removed from the media bays. The removability of the media bay devices allows a few media bays to support a variety of different types of devices in a flexible manner.

The keyboard **2314** is used by a user to input commands 15 and other instructions to the computer system **2300**. Other types of user input devices can also be used in conjunction with the present invention. For example, pointing devices such as a computer mouse, a track ball, a stylus, or a tablet can be used to manipulate a pointer on a screen of a 20 general-purpose computer.

The invention can use a combination of hardware and software components. The software can be embodied as computer readable code on a computer readable medium. The computer readable medium is any data storage device 25 that can store data which can thereafter be read by a computer system. Examples of the computer readable medium include read-only memory, random-access memory, CD-ROMs, magnetic tape, optical data storage devices. The computer readable medium can also be distributed 30 over a network coupled computer system so that the computer readable code is stored and executed in a distributed fashion.

The advantages of the invention are numerous. Different embodiments or implementations may yield one or more of 35 the following advantages. One advantage of the invention is that sophisticated layouts/reports are able to be created in an automated manner. Another advantage of the invention is that header and footers, styles, sorts, and summary fields can be provided within the layout/reports. Still another advantage 40 of the invention is that technical service inquiries concerning creation of sophisticated reports can be significantly reduced. Yet another advantage of the invention is that ease of use and user satisfaction are improved.

The many features and advantages of the present invention 45 are apparent from the written description, and thus, it is intended by the appended claims to cover all such features and advantages of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact 50 construction and operation as illustrated and described. Hence, all suitable modifications and equivalents may be resorted to as falling within the scope of the invention.

What is claimed is:

**1.** A method for creating a report or layout for data stored 55 in a database, said method comprising:

- (a) performing an interview sequence, by a database program, to obtain organization information associated with the database, the organization information including at least a list of fields defined for the database and 60 at least one summary field for the report or layout, the at least one summary field being associated with at least one of the fields in the list of field, wherein the database program is capable of accessing the data stored in the database, and wherein the interview sequence comprises 65 determining whether a script should be generated for the report or layout; and

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- (b) automatically creating, by the database program, the report or layout based on the organization information obtained by the database program through the interview sequence, wherein the database program operates to automatically create the report or layout; and

- (c) automatically generating the script by the database program when it is determined during the interview sequence that the script should be generated, wherein the script when executed allows another report or layout to be automatically generated based on the interview sequence.

**2.** A method as recited in claim **1**, wherein the summary field is a subtotal or a grand total of the data in the associated fields.

**3.** A method as recited in claim **2**, wherein the summary field provides one of a total, count, average, minimum, and maximum of the data for the field associated with the summary field.

**4.** A method as recited in claim **2**, wherein the list of fields is an ordered list or fields.

**5.** A method as recited in claim **2**, wherein the organization information further includes a style for the layout or report.

**6.** A method as recited in claim **1**, wherein the organization information further includes a style for the layout or report.

**7.** A method as recited in claim **6**, wherein the style for the layout or report identifies particular characteristics for the layout or report including a plurality of background color, text size, text font, text style, and other colors.

**8.** A method as recited in claim **1**, wherein the organization information further includes header or footer information for the layout or report, the header or footer information including at least one of a logo and custom text.

**9.** A method as recited in claim **1**, wherein said method produces a report, and wherein the organization information further includes a category that identifies the field on which the report is organized.

**10.** A method as recited in claim **9**, wherein the organization information further includes a plurality of categories that are ordered, and the categories identify the fields and a hierarchy on which the report is organized.

**11.** A method as recited in claim **10**, wherein the summary field is a subtotal or a grand total of the data in the associated fields.

**12.** A method as recited in claim **11**, wherein the summary field provides one of a total, count, average, minimum, and maximum of the data for the field associated with the summary field.

**13.** A method as recited in claim **1**, wherein the organization information further includes sort fields for the report or layout.

**14.** A method as recited in claim **1**, wherein the report or layout has a plurality of parts, the parts including header, grand total, summary, body, and footer.

**15.** A method as recited in claim **1**, wherein the interview sequence further comprises:

- determining during the interview sequence whether one or more of: a leading grand total, a leading sub-summary, a trailing sub-summary, and a trailing grand total should be generated for the layout or report; and
- generating one or more of: the leading grand total, the leading sub-summary, the trailing sub-summary and the trailing grand total when it is determined during the interview that one or more of: the leading grand total,

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the leading sub-summary, and the trailing grand total, the trailing sub-summary should be generated.

**16.** A method as recited in claim 1,

wherein the interview sequence further comprises: determining during the interview sequence whether a leading grand total, a leading sub-summary, a trailing sub-summary, and a trailing grand total should be generated for the layout or report; and

generating the leading grand total only when it is determined during the interview sequence that the leading grand total should be generated;

generating the leading sub-summary only when it is determined during the interview sequence that the leading sub-summary should be generated;

generating the trailing sub-summary only when it is determined during the interview sequence that the trailing sub-summary should be generated; and

generating trailing grand total only when it is determined during the interview sequence that the trailing grand total should be generated.

**17.** A method as recited in claim 16, wherein said method further comprises:

determining based on the interview sequence whether the report or layout should include a body;

placing the grand total in a leftmost position in a grand total area when the determining determines that report or layout should not include a body;

determining based on said interview whether the grand total to be placed is dependent on a field to be placed in the report or layout;

placing the grand total in a grand total area based on the placement of the field to be placed when the determining determines that grand total to be placed is dependent on a field to be placed; and

placing the grand total in a leftmost position in a grand total area in the report or layout when said determining determines that that grand total to be placed is not dependent on a field to be placed.

**18.** A method as recited in claim 17, wherein said method further comprises:

determining based on the interview sequence whether placement of a leading or trailing sub-summary is dependent on a field that is to be placed in the body of the report or layout only when the determining determines based on said interview that the report or layout should include a body; and

placing the leading or trailing sub-summary in a sub-summary area in the report or layout based on the placement of the field that is to be placed in the body when said determining determines based on the interview sequence that the placement of the leading or trailing sub-summary is dependent on a field that is to be placed in the body.

**19.** A method as recited in claim 18, wherein said method further comprises:

determining based on the interview sequence whether placement of a leading or trailing sub-summary is dependent on a field that is to be placed in a position other than the body only when the determining determines based on said interview that the report or layout should include a body; and

placing the leading or trailing sub-summary in a sub-summary area in the report or layout based on the placement of the field that is to be placed in a position other than the body in the report or layout when said determining determines based on the interview sequence that the placement of the leading or trailing sub-summary is dependent on a field that is to be placed in the body.

## 16

**20.** A method for creating a report layout for data stored in a database, said method comprising:

(a) performing an interview sequence, by a database program, to obtain organization information, the organization information including at least a list of fields and at least one summary field for the report layout, the at least one summary field being associated with one of the fields in the list of fields, the report layout including a plurality of parts including a header area, a grand total area, a summary area, a body area, and a footer area, wherein the database program is capable of accessing the data stored in the database, and wherein the interview sequence comprises determining whether a script should be generated for the report or layout; and

(b) automatically creating the report layout based on the interview sequence, said creating includes placing the summary field in at least one of the grand total area and the summary area, and placing the fields in the list of fields in the body area and;

(c) automatically generating the script when it is determined during the interview sequence that the script should be generated, wherein the script when executed allows another report or layout to be automatically generated based the interview sequence.

**21.** A method as recited in claim 20, wherein when the summary field is a subtotal, said creating (b) places the subtotal in the summary area.

**22.** A method as recited in claim 21, wherein the subtotal is placed in the summary area at a position corresponding to the position as the associated one of the fields placed in the body.

**23.** A method as recited in claim 20, wherein the subtotal is placed in the summary area in the same column location in the report layout as the one of the fields placed in the body that corresponds thereto.

**24.** A method as recited in claim 20, wherein when the summary field is a grand total summary field, said creating (b) places the grand total in the grand total area.

**25.** A method as recited in claim 24, wherein the grand total summary field is placed in the grand total area at a position corresponding to the position as the associated one of the fields placed in the body.

**26.** A method as recited in claim 24, wherein the grand total summary field is placed in the grand total area in the same column location in the report layout as the one of the fields placed in the body that corresponds thereto.

**27.** A method as recited in claim 20, wherein the organization information further includes sort fields for the report or layout.

**28.** A method as recited in claim 27, wherein said method further comprises:

(c) producing a report for the data using the report layout.

**29.** A method as recited in claim 28, wherein said producing (c) sorts the data in accordance with the sort fields for the report.

**30.** A method as recited in claim 20, wherein the organization information further includes a theme selection for the report layout.

**31.** A method as recited in claim 20, wherein the organizational information includes at least first and second of summary fields, the first summary field is a grand total summary field and the second summary field is summary field, and

wherein said creating (b) of the report layout comprises:

(b1) placing the first summary field in the grand total area;

(b2) placing the second summary field in the summaries area; and

(b3) placing the fields in the list of fields in the body area.

**32.** A computer readable medium including computer program code for a database program that is capable of creating a report layout for data stored in a database, said computer readable medium comprising:

computer program code for performing an interview 5  
sequence to obtain organization information, the organization information including at least a list of fields, the report layout including a plurality of parts including a header area, a grand total area, a summary area, a body area, and a footer area, wherein the database 10  
program is capable of accessing the data stored in the database, and wherein the interview sequence comprises determining whether a script should be generated for the report or layout;

computer program code for creating the report layout based on the interview sequence, the creating of the report layout includes placing the fields in the list of fields in the body area; and

computer program code for automatically generating the script when it is determined during the interview sequence that the script should be generated, wherein 20  
the script when executed allows another report or layout to be automatically generated based the interview sequence.

**33.** A computer readable medium as recited in claim **32**, wherein the organization information further includes header or footer information for the layout or report, the header or footer information including at least one of a logo and custom text.

**34.** A computer readable medium as recited in claim **32**, wherein the organization information further includes a category that identifies the field on which the report layout is organized.

**35.** A computer readable medium as recited in claim **32**, wherein the organization information further includes a plurality of categories that are ordered, and the categories identify the fields and a hierarchy on which the report layout is organized.

**36.** A computer readable medium as recited in claim **32**, wherein the organizational information further includes at least one summary field for the report layout, the at least one summary field being associated with one of the fields in the list of fields, and

15 wherein said computer program code for creating the report layout comprises: computer program code for placing the summary field in at least one of the grand total area and the summary area and placing the fields in the list of fields in the body area.

**37.** A computer readable medium as recited in claim **36**, wherein the summary field is a subtotal or a grand total of the data in the associated fields.

**38.** A computer readable medium as recited in claim **37**, wherein the summary field provides one of a total, count, average, minimum, and maximum of the data for the field associated with the summary field.

\* \* \* \* \*

UNITED STATES PATENT AND TRADEMARK OFFICE  
**CERTIFICATE OF CORRECTION**

PATENT NO. : 7,000,182 B1  
APPLICATION NO. : 09/378526  
DATED : February 14, 2006  
INVENTOR(S) : Iremonger et al.

Page 1 of 1

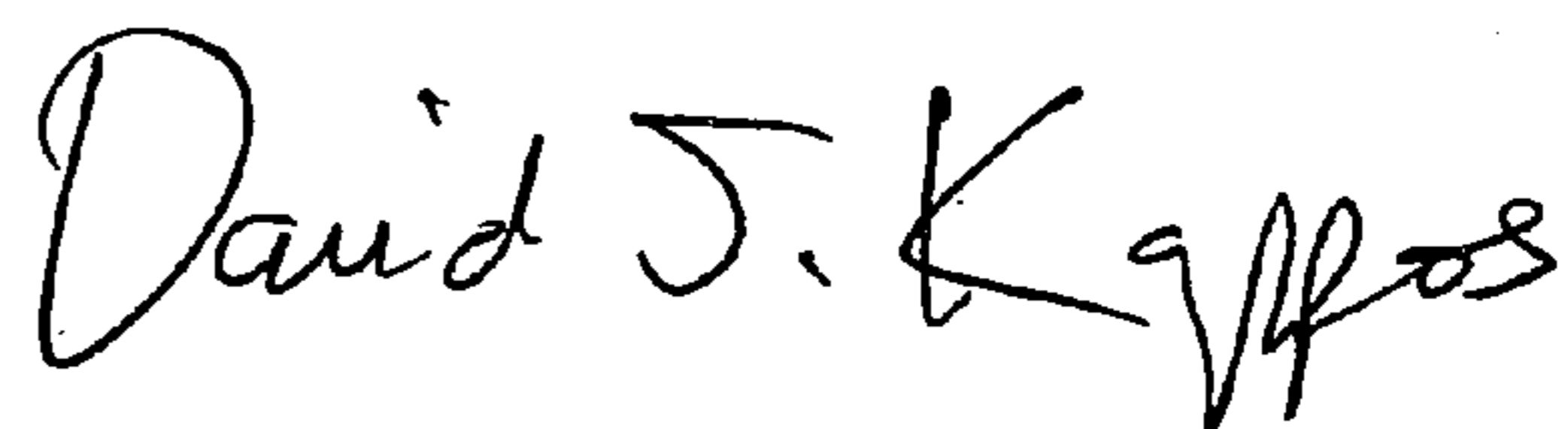
It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

**In the Title Page:**

In section (73) Assignee, change "Sun Microsystems, Inc., Santa Clara, CA (US)" to --Apple Computer, Inc., Cupertino, CA (US)--.

Signed and Sealed this

Sixteenth Day of March, 2010

A handwritten signature in black ink that reads "David J. Kappos". The signature is written in a cursive, flowing style.

David J. Kappos  
*Director of the United States Patent and Trademark Office*